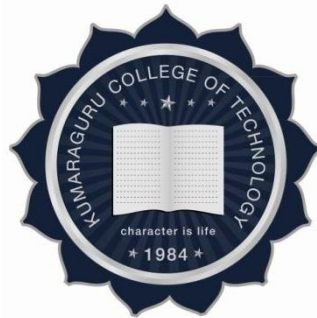
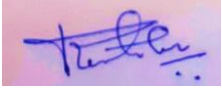


PG PROGRAMME
MASTERS OF TECHNOLOGY MANAGEMENT (MTM)
REGULATIONS 2018
CURRICULUM AND SYLLABUS
I - IV Semesters (Version-2,2020)



Department of Textile Technology
KUMARAGURU COLLEGE OF TECHNOLOGY
COIMBATORE

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MASTER OF TECHNOLOGY MANAGEMENT

Program Educational Objectives (PEO)

At the end of the program

PEO 1: Graduates shall become management professionals with the ability to plan, evaluate, deploy, and manage emerging technologies.

PEO 2: Graduates shall be able to lead technology teams in an organisation to create business value with rigorous execution capabilities.

PEO 3: Graduates shall become professionals in leading research and innovation initiatives in academia, government & industry.

Program Outcomes (PO)

Upon completion of the Master of Technology Management program, the student will be able to:


PO1: Apply their capabilities acquired in technology management to identify business solutions that would enhance internal efficiency and external market growth

PO 2: Identify, analyse, and integrate solutions for industrial digital transformation across various sectors.

PO 3: Adapt and work efficiently with multidisciplinary teams across various Organisational levels.

PO 4: Articulate and document all the information's more precisely and meaningfully.


PO 5: Exhibit an ethical and responsible behaviors in all business decisions

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REGULATIONS 2018
Master of Technology Management (MTM)
CURRICULUM AND SYLLABUS


SEMESTER I							
Course Code	Course Title	Course Mode	L	T	P	J	C
P18TMT1104	Engineering Research Methodology	Theory	3	0	0	0	3
P18TMT1105	Business Operations and Strategy	Theory	3	0	0	0	3
P18TMT1106	Managerial Economics	Theory	3	0	0	0	3
P18TMP1501	Artificial Intelligence & Machine Learning	Practical	0	0	4	0	2
P18TME---	Elective - 1	Theory	3	0	0	0	3
P18TME---	Elective - 2	Theory	3	0	0	0	3
Total Credits							17
Total Hours per week							19

SEMESTER-II							
Course Code	Course Title	Course Mode	L	T	P	J	C
P18TMT2104	Agile Product Management	Theory	3	0	0	0	3
P18TMT2105	Industrial Digital Transformation	Theory	3	0	0	0	3
P18TMT2106	Project Management	Theory	3	0	0	0	3
P18TME---	Elective - 3	Theory	3	0	0	0	3
P18TME---	Elective - 4	Theory	3	0	0	0	3
Total Credits							15
Total Hours per week							15

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SEMESTER-III							
Course code	Course Title	Course Mode	L	T	P	J	C
P18TME---	Elective - 5	Theory	3	0	0	0	3
P18TME---	Elective - 6	Theory	3	0	0	0	3
P18TMP3703	MSME Practicum	Presentation	0	0	0	8	4
P18TMP3704	Industrial Practicum- Phase 1	Project	0	0	0	20	10
Total credits							20
Total Hours per week							34

SEMESTER-IV							
Course code	Course Title	Course Mode	L	T	P	J	C
P18TMP4705	Industrial Practicum- Phase 2	Project	0	0	0	24	12
P18TMP4706	Global/National Immersion	Presentation	0	0	0	12	6
Total credits							18
Total Hours per week							36
Grand Total Credits							70

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List of Professional Elective specialization

S.No	List of Professional Electives
1	Textile Technology
2	Innovation and Technology
3	Business Management
4	Information Technology
5	Sustainability

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Professional Elective 1: Textile Technology		L	T	P	J	C
Course Code	Course					
P18TME0001	Management of Textile Production	3	0	0	0	3
P18TME0002	Apparel Production	3	0	0	0	3
P18TME0003	Apparel Technology Management	3	0	0	0	3
P18TME0004	Strategic Technology Management in the Textile Complex	3	0	0	0	3
P18TME0005	Global Perspectives in Textiles Supply Chain Management	3	0	0	0	3

Professional Elective 2: Innovation and Technology		L	T	P	J	C
Course Code	Course					
P18TME0034	Applied Design Thinking	3	0	0	0	3
P18TME0035	Industrial Design & Development	3	0	0	0	3
P18TME0036	IPR Fundamentals and Patent Drafting	3	0	0	0	3
P18TME0037	Rapid Prototyping Fundamentals	3	0	0	0	3


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Professional Elective 3: Business Management		L	T	P	J	C
Course Code	Course					
P18TME0038	Supply Chain Management	3	0	0	0	3
P18TME0039	Nascent Market Strategies	3	0	0	0	3
P18TME0040	Organisation Behavior and Change Management	3	0	0	0	3
P18TME0058	Knowledge Management	3	0	0	0	3
P18TME0059	New Product Strategies	3	0	0	0	3
P18TME0043	Lean Six Sigma	3	0	0	0	3
P18TME0044	Finance for Engineers	3	0	0	0	3
P18TME0045	Digital Marketing	3	0	0	0	3
P18TME0046	Entrepreneurial Mindset and Methods	3	0	0	0	3


Professional Elective 4. Information Technology		L	T	P	J	C
Course Code	Course					
P18TME0047	Data Mining Techniques	3	0	0	0	3
P18TME0048	Data Science & Analytics with Python	3	0	0	0	3
P18TME0049	Data Visualization	3	0	0	0	3
P18TME0050	Big Data Technologies	3	0	0	0	3
P18TME0051	Block Chain Technology	3	0	0	0	3
P18TME0052	Artificial Intelligence	3	0	0	0	3

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Professional Elective 5: Sustainability		L	T	P	J	C
Course Code	Course					
P18TME0053	Environmental Sustainability	3	0	0	0	3
P18TME0054	Industrial Sustainability	3	0	0	0	3
P18TME0055	Supply Chain and Procurement Sustainability	3	0	0	0	3
P18TME0056	Textile Sustainability and Innovation	3	0	0	0	3
P18TME0057	Circular Economy for Enterprise Innovation	3	0	0	0	3

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P18TMT1104	ENGINEERING RESEARCH METHODOLOGY	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Define research; explain and apply research terms; describe the research process; Identify research gap and formulate research objectives						
CO2: Develop a research plan; Explain and apply parametric tests and non-parametric tests in research.						
CO3: Demonstrate the analytical skills by applying statistical tools and optimization techniques						
CO4: Evaluate the paper to qualify for publication in indexed journals						
Course Assessment Methods						
Direct						
1. Midterm Examination						
2. Assignment; Field study, Group Presentation						
3. End Semester Examination						
Indirect						
1. Course End survey						
Introduction to Engineering Research Methodology						6 Hours
Objectives and Motivation in Research, Various approaches to Research, Scientific and Engineering Research, Observational Research, Significance of research, Selecting a Research Problem, Purpose of Research, Approaches in Research Process, Formulation of research objectives, Measure of Good Research, Literature Search, Need of Literature Review, Research gap, Identifying variables, Reference Management Software Zotero/Mendeley						
Statistical Analysis						11 Hours
Data types, Measures of Central Tendency, Measures of Dispersion, Measures of Association, Sources of Error and uncertainty, One-dimensional Statistics, Two-dimensional statistics - Analysis using MS Excel						
Research Design						12 Hours
Research Survey, Population and Sample, Sample size, Sampling Methods, Measurement of Scaling, Data collection Methods, , Questionnaires design, Validity and Reliability tests, Parametric and Non-parametric tests, Hypothesis Testing, t-test, z-test, ANOVA, Correlation Analysis, Regression Analysis, Chi-square test, Problem solving using SPSS software						
Optimization Techniques						12 Hours
Cost of Production, Value Engineering, Process Improvement, Application of Linear Programming, Transport route optimization, Queuing Theory, Problem solving using Tora software						

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Research Publication	4 Hours
Research Paper Writing, Journals in Engineering Management, Identifying Indexed Journals, Paper formatting, Reference Style of referencing, Conference Presentation, Patenting, Ethical issues related to publishing, Plagiarism and Self-Plagiarism. Use of Latex software	
Total Hours: 45 Hrs	
REFERENCES	
<ol style="list-style-type: none"> 1. David V. Thiel, Research Methods for Engineers, Cambridge University Press, 2014 2. Donald Cooper & Pamela Schindler, Business Research Methods –TMGH, 9th edition 3. David M. Levine, David F. Stephan, Kathryn A. Szabat, “ Statistics for Managers Using Microsoft Excel”, Pearson, 4. S. Jaisankar, Data Analysis for Management Research, Archers and Elevators, 2015 5. Jaisankar S, Operations Research – Decision Models Approach, Excel Publications, New Delhi, 2009 6. C.R. Kothari, Research Methodology Methods and Techniques, 3/e, New Age International Publishers, 2014. 	

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P18TMT1105	BUSINESS OPERATIONS AND STRATEGY	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Explain strategy and strategic management process.						
CO2: Analyse various environment and portfolio scenarios for an effective strategy formulation.						
CO3: Formulate corporate, business, and functional strategies with a global outlook						
Course Assessment Methods						
Direct						
1. Midterm Examination						
2. Other Assessments						
3. End Semester Examination						
Indirect						
1.Course-End survey						
Foundations of Strategic Management						10 Hours
Strategic Planning Process, Levels of Strategy - Strategic Intent through Vision, Mission and Value Statement – Building business model –Business Model canvas.						
Internal Environment Analysis, External Environment Analysis						12 Hours
Core competence, Distinctive Competencies, Resource-Based View of the firm - Resource-Capabilities – Firm-specific resources, VRIO Framework. Competitive Profile analysis - Building Blocks of Competitive Advantage - Porters Five Force Model, Building Competitive Advantage - Value Creation and Value Proposition approach. Strategic Choice and Strategic Thrust.						
Strategy Formulation						8 Hours
Generic strategies, Functional strategies- Components - Relevant Techniques. Corporate Strategies, Disruptive strategies- Blue Ocean strategy. Global strategies. Termination strategies						
Strategy Implementation						7 Hours
Managing Change - Activating Strategies-Project Implementation – Procedural Implementation – Resource Allocation - Organizational Design – Structure, Control and Culture.						

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Strategy Evaluation and Control	8 Hours
Process of evaluation - Strategic and Operational controls - 7S Framework, Balanced Score Card. Benefit-Cost Analysis, Performance Gap Analysis, Responsibility Centres.	
Total Hours: 45Hrs	
REFERENCES	
<ol style="list-style-type: none"> 1. AzharKazmi, Strategic Management & Business Policy, 3rd edition, 2011, TMH 2. Arthur A. Thompson, Jr., A. J. Strickland III, John E. Gamble, Arun K Jain, Crafting and Executing Strategy (SIE): The Quest for Competitive Advantage: Concepts and Cases, 16/e TMH. 3. Charles W.L.Hill, Gareth R.Jones, Mellissa A. Schilling – Strategic Management: An integrated approach Cengage, 9th edition. 2012 	

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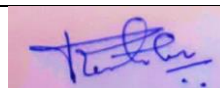
P18TMT1106	MANAGERIAL ECONOMICS	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Explain the concepts revolving around Microeconomics. CO2: Apply the concept in real time production and market environment. CO3: Explain the concepts concerning to Macro Economics.						
Course Assessment Methods						
Direct						
1. Midterm Examination 2. Other assessments 3. End Semester Examination						
Indirect						
1.Course-End survey						
Introduction						3 Hours
Introduction of Managerial Economics - Scope, Relationship with other Disciplines						
Micro Economics						6 Hours
Microeconomics - Firms and Managerial Objectives - Demand, Law of Demand, Determinants of demand, Elasticity of demand, Law of diminishing marginal utility - Exceptions of Demand - Demand forecasting techniques (only theory) - Supply, Law of Supply, Elasticity of Supply						
Production Functions						10 Hours
Production functions – Short and long run laws of production, law of returns to scale - Cost - types of cost, Short and long run cost output relationship, Economies and diseconomies of Scale						
Market Structure						14 Hours
Market Structure - Perfect Competition, monopoly, duopoly, oligopoly, Monopolistic market structures - characteristics & Price - Output determination - Pricing Methods						
Macro Economics						12 Hours
Macroeconomics - nature & importance. National Income - concepts - GNP, GDP, NNP - Business cycle - Phases of Business Cycle - Controlling Trade Cycle - Inflation - Definition, Kinds and effects of Inflation, Demand Pull & Cost Push Inflation - Policy Measures to control - Indian Financial System, Fiscal Policy: Definition, Objectives. Monetary Policy-Meaning, Scope, Instruments						
Total Hours: 45Hrs						

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REFERENCES


1. D N Diwedi (2009). Managerial Economics. Seventh Edition, Vikas Publication
2. Piyali Ghosh Geetika, Purba Roy Chowdhury (2017).Managerial Economics, 3 e, McGraw-Hill Education

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P18TMP1501	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING	L	T	P	J	C
		0	0	4	0	2
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Apply the concepts of AI in building solutions for real-world problems CO2: Apply the concepts of AI to data models & analyse the data obtained from AI applications and understand the significance of adding intelligence to IoT applications CO3: Demonstrate the learning by identifying the opportunity to enhance the business potential using AI/ML technologies.						
Course Assessment Methods						
DIRECT						
1. Other Assignments 2. End Semester Practical Examination						
INDIRECT						
1.Course-end survey						
AI/ML 101						10 Hours
Introduction to AI/ML - Current scenario of AI research and its applications, Key business drivers of AI across various job functions, countries, and sectors. When could an Alexa-like personal assistant be able to plan my day?						
Semiconductors & AI						10 Hours
AI Hardware- Semiconductors have accelerated the rise of AI applications and research, current state for lidar systems, sensors, actuators, other hardware						
Natural Language Processing & Speech Recognition						10 Hours
Natural Language Processing & Speech Recognition- history of Natural Language Processing & Speech Recognition along with latest applications and researches. Case studies on Industry best practices.						
Computer Vision						10 Hours
Computer Vision - Progression of Computer Vision over the years. This session will help them know the latest applications and research in CV, practice some best practices, autonomous vehicles.						
AI Disruptions						10 Hours
AI Disruptions - Impact of AI/ML in various sectors and an avalanche of disruptions in Automotive, Insurance, Healthcare, Retail, Logistics, Consumer and more.						
Investments In AI						10 Hours
AI Investment Landscape- Create a new product/service or create efficiencies with a human-centred approach to AI in an existing industry and discuss what the winning business models of AI are.						
Total Hours: 60Hrs						

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REFERENCES
<ol style="list-style-type: none">1. Required Textbook: “The New Acceleration: An Introduction to Artificial Intelligence and the Technologies Making Life Faster” by Kerrigan and David2. “AIX: Designing Artificial Intelligence” by Sudha Jamthe3. AI Playbook: http://aiplaybook.a16z.com/

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P18TMT2104	AGILE PRODUCT MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Determine what is valuable to a user early by focusing on testable narratives and creating a strong shared perspective						
CO2: Drive a focus on outcomes over outputs by facilitating a culture of experimentation and a test-driven, results-driven approach to agile						
CO3: Build an analytics (and data science) program that enhances the data-based decision making to achieve the core objectives						
CO4: Iteratively identify and test the right agile practices from leading frameworks like Scrum, XP, and kanban in the team's work						
Course Assessment Methods						
Direct						
1. Midterm Examination						
2. Other Assignments						
3. End Semester Examination						
Indirect						
1.Course-End survey						
Agility as a Concept					10 Hours	
Identify what's hard about creating excellent products and how agile can help, the problems agile solves, Personas and problem scenarios focus development on driving toward a valuable outcome, drafting personas and hypothesizing user needs to test those assumptions, prepare agile user story to build something valuable for the user.						
Hypothesis Driven Decisions					10 Hours	
Hypothesis-driven decisions, Design various concept testing methods as an integral part of your product pipeline. Apply Product hypothesis tool & Product canvas, to design and run situation-appropriate experiments to test ideas, and how that works before the fact (when you're testing an idea) and after the fact (when you're testing the value of the prototype version deployed). Understand Usability, Feasibility & Viability.						

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Analytics for Decision Making	15 Hours
Customer Analytics, Demand Analytics, UX Analytic, Analytics & Data Science, Tools & techniques for startup founders to use data for decision making.	
Scrum and Its Concepts	10 Hours
An overview of Agile method for modern day project management, an overview of the Scrum Framework, Scrum Roles & Responsibilities, Scrum Artefacts, Scrum Events, Supporting Tools & Best Practices.	
Total Hours: 45Hrs	
REFERENCES	
<ol style="list-style-type: none"> 1. Agile Project Management for Dummies Paperback – 4 May 2012 by Mark C. Layton 2. Agile Estimating and Planning (Robert C. Martin) Paperback – Illustrated, 1 November 2005 by Mike Cohn 3. Scrum Mastery: From Good to Great Servant Leadership Paperback – 1 June 2013 by Geoff Watts 	

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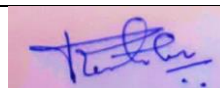
P18TMT2105	INDUSTRIAL DIGITAL TRANSFORMATION	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Understand the drivers and enablers of Industry 4.0 CO2. Discover the smartness in smart Factories, smart cities, smart products, and smart services CO3. Able to outline the various systems used in a manufacturing plant and their role in an Industry 4.0 world CO4. Understand the power of cloud computing in a networked economy CO5. Demonstrate the opportunities, challenges brought about by Industry 4.0 and how organisations and individuals should prepare to reap the benefits						
Course Assessment Methods						
DIRECT						
1. Midterm Examination 2. Other Assignments 3. End Semester Examination						
INDIRECT						
1.Course-End survey						
Introduction to Industry 4.0					9 Hours	
The Various Industrial Revolutions - Digitalization and the Networked Economy - Drivers, Enablers, Compelling Forces and Challenges for Industry 4.0 - The Journey so far: Developments in USA, Europe, China and other countries - Comparison of Industry 4.0 Factory and Today's Factory - Trends of Industrial Big Data and Predictive Analytics for Smart Business Transformation -Summary						
Smart Technologies					9 Hours	
Internet of Things (IoT) & Industrial Internet of Things (IIoT) & Internet of Services - Smart Manufacturing - Smart Devices and Products - Smart Logistics - Smart Cities - Predictive Analytics - Summary						
Related Disciplines, System, Technologies for Enabling Industry 4.0					9 Hours	
Cyber physical Systems - Robotic Automation and Collaborative Robots - Support System for Industry 4.0 - Mobile Computing - Related Disciplines - Cyber Security - Summary						
Role of Data, Information, Knowledge and Collaboration in Future Organizations					9 Hours	
Resource-based view of a firm - Data as a new resource for organizations - Harnessing and sharing knowledge in organizations - Cloud Computing Basics - Cloud Computing and Industry 4.0 - Summary						
Other Applications and Case Studies					9 Hours	
Industry 4.0 laboratories - IIoT case studies - Case studies from HKPolyU students – Summary						
Business Issues in Industry 4.0						
Opportunities and Challenges - Future of Works and Skills for Workers in the Industry 4.0 Era - Strategies for competing in an Industry 4.0 world - Summary						
Total Hours: 45Hrs						

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REFERENCES

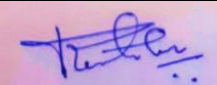
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| <ol style="list-style-type: none">1. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 978-1-4493- 9357-12. Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 20143. Industry 4.0: The Industrial Internet of Things by Alasdair Gilchrist- ISBN 978-1-4842-2047-4 |
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P18TMT2106	PROJECT MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Explain the knowledge areas of project management.						
CO2: Apply tools and techniques of project management to monitor and control projects						
CO3: Construct a project schedule and estimate cost using MS Project software						
Course Assessment Methods						
DIRECT						
1. Midterm Examination						
2. Other Assignments						
3. End Semester Examination						
INDIRECT						
1.Course-End survey						
Introduction						9 Hours
Definition - Operations and Project Management - Program Management - Portfolio Management - Projects and Strategic Planning - Project Management Office - - Role of Project Manager –Processes and Processes Groups – Process Mapping – Project Team – Project Life Cycle – Stakeholders - Deliverables – Milestone - Organizational Structures - Organizational Cultures and Styles - Organizational Process Assets- Enterprise Environmental Factors - Project Charter						
Project Scope Management						7 Hours
Define Scope - Project Management Plan - Project Scope Management Processes - Plan Scope Management - Collect Requirements - Create WBS – Work packages - Validate Scope – Control Scope						
Project Time Management						7 Hours
Network models - Project Time Management Processes - Plan Schedule Management - Define Activities - Sequence Activities - Estimate Activity Resources— Estimate Activity Durations— Develop Schedule- Control Schedule						
Project Cost Management						7 Hours
Managing Project Cost - Plan Cost Management—Estimate Costs— Determine Budget – Control cost – Earned Value Management – To complete performance index – Performance reviews						
Project Quality Management						7 Hours
Quality definition – Project Quality Management- Quality Assurance Control Quality, Tools and Techniques						

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Basics of Other Knowledge Areas	8 Hours
Project Human Resource Management – Project Communication Management - Project Risk Management - Project Procurement Management – Project Stakeholder Management - Introduction and basic concepts - Introduction to MS Project software– Exercise problems	
Total Hours: 45Hrs	
REFERENCES	
<ol style="list-style-type: none"> 1. A. Chandrasekaran, 2013, Road to Success, Info career Pvt. Ltd., 2nd Edition 2. Joseph Phillips, 2013, Project Management Professional, Tata McGraw Hill Ltd.,4th edition 	

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P18TMP3703	MSME PRACTICUM	L	T	P	J	C
		0	0	0	8	4
Course Outcomes						
After successful completion of this course, the students should be able to						
CO 1: Understand the operations of MSME organisations						
CO 2: Identify the scope of technology interventions in MSME organisations						
CO 2: Analyse and present solutions for technology interventions in MSME organisations						
Course Assessment Methods						
DIRECT						
1. Project report and viva voce examination						
INDIRECT						
1.Course-End survey						
<p>The students shall seek their internship in MSME companies during their summer vacation and shall work part-time/full time as technology managers to understand the operation, study the challenges, and define the opportunities for changes and scope for industrial digital transformation.</p> <p>During MSME Practicum, students shall get exposed to real-time industrial work, culture, and practices to become able technology managers. Students shall be jointly supervised and mentored by a team consisting of Academic mentor/company supervisor and Industry Mentor.</p>						

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P18TMP3704	INDUSTRIAL PRACTICUM- PHASE 1	L	T	P	J	C
		0	0	0	20	10
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Critically Evaluate and review the existing solutions and methodologies through reviewing literature to solve engineering problems.						
CO2. Identify the modern tools and plan the project according to principles of project management.						
Course Assessment Methods						
DIRECT						
1.Project report and viva voce						
INDIRECT						
1.Course-End Survey						
Phase 1: Students start working on their project work in beginning of third semester. Student do the background research for identifying appropriate problems, methodology and tools for their respective project works. Each student is required to prepare a synopsis in the format provided and present it in front of a committee constituted by course facilitators						

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P18TMP4705	INDUSTRIAL PRACTICUM- PHASE 2	L	T	P	J	C
		0	0	0	24	12
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1. Devise original solutions to complex engineering problems using modern engineering tools.						
CO 2. Justify the outcomes of the project work.						
CO 3. Organize and communicate (written and oral) ideas effectively.						
CO 4. Develop solutions that meet ethical, societal, and legal considerations.						
Course Assessment Methods						
DIRECT						
1.Project report and viva voce						
INDIRECT						
1.Course-End Survey						
Phase 2: Students carry out implementation of their respective projects based on the problem identified, methodology and tools suggested in the synopsis prepared and presented in phase 1. They prepare the final project reports according to the format provided. Each student is required to present his/her project work in front of internal project guide and external examiner appointed by Controller of Examination						

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P18TMP4706	GLOBAL/NATIONAL IMMERSION	L	T	P	J	C
		0	0	0	12	6
Course Outcomes						
After successful completion of this course, the students should be able to						
CO 1: Experience new cultures, changing their way of thinking, understanding the Global/National perspectives in technology management.						
CO 2: Demonstrate in-depth knowledge in the opted academic study program						
Course Assessment Methods						
DIRECT						
1.Evaluation will be based on learning experiences and presentation with a report.						
INDIRECT						
1.Course-end survey						
<p>Global Immersion: International initiatives vide which the students go to the renowned universities/partner institutions. Global Immersion focuses on allowing students to study abroad for a semester, attend summer school, internships in abroad organisations through international partnership. This immersion gives the opportunity for students to experience new cultures, changing their way of thinking, understanding the global perspectives in technology management.</p> <p>National Immersion: National immersion is an initiative vide which the students go to the renowned National universities/partner institutions. Students shall be provided with an opportunity to do Immersion through in large and medium organisation, start-up/ incubation ecosystem on selected areas related to engineering and technology management with the help of partnered intuitions. Cross major studies/courses in National partnered institution/ University shall be provided with mentor guidance.</p>						

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Professional Elective - 1

Textile Technology

Professional Elective 1: Textile Technology		L	T	P	J	C
Course Code	Course					
P18TME0001	Management of Textile Production	3	0	0	0	3
P18TME0002	Apparel Production	3	0	0	0	3
P18TME0003	Apparel Technology Management	3	0	0	0	3
P18TME0004	Strategic Technology Management in the Textile Complex	3	0	0	0	3
P18TME0005	Global Perspectives in Textiles Supply Chain Management	3	0	0	0	3

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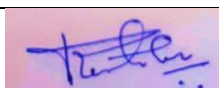
P18TME0001	MANAGEMENT OF TEXTILE PRODUCTION	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Analyze the structure of Textile Industry CO2: Evaluate the production planning in spinning industry CO3: Apply the quality management system in spinning industry CO4: Explain the fabric production systems. CO5: Evaluate wet processing and pollution control systems. CO6: Apply the enterprise resource planning in Textile Industry						
COURSE ASSESSMENT METHODS						
DIRECT						
1. Midterm Examination 2. Assignment; Presentation 3. End Semester Examination						
INDIRECT						
1.Course-end survey						
Introduction						9 Hours
Indian Textile Industry: Structure, Cotton ginning Industry. Manmade fibre industry spinning Industry weaving Industry sequence of processes. Textile processing Industry, Knitting industry Garment industry Technical textiles Industry. Textile Policy. Sickness of Textile Industry- Analysis and options. Global textile scenario.						
Ginning and Spinning Industry						9 Hours
Ginning concept cotton varieties cotton production in India and world. Spinning- blow room operating principle, carding operating principle, draw frame simplex, spinning-ring spinning, open end spinning Production, planning and control: types of production systems and problems of planning and control, Quality management. Balancing of Machinery, Waste Management, Power requirement,						
Weaving Industry						9 Hours
Power loom sector. Type of looms used. Conventional looms, automatic looms, shuttles less looms-projectile, rapier, air jet, water jet looms. Production capacity Status of Technology used. Labour problems. Techno economics of power loom industry. Productivity and improvement techniques. Skill requirements. Organized mill sector, Quality management						
Textile Wet Processing						9 Hours
Souring and bleaching, Dyeing methods, Dyeing machines-winch dyeing, Gigger dyeing, Soft flow dyeing, Water requirements for dyeing, effluent tremens, pollution control, statutory requirements, zero discharge of effluents						
Knitting and Garment Industry						9 Hours
Knitting concept. Warp and weft knitting. Circular knitting machines- conventional and high-speed knitting machines productivity. Garment industry pattern making and cutting, stitching, quality checking and packing. Sourcing: Material Requirement Planning vendor relations, selection of vendors., Manpower requirement						
Total Hours: 45Hrs						

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REFERENCES


1. Oxtoby E “Spun Yarn Technology” butter worth’s, London, New Edition 2002.
2. Adanur S., “Handbook of Weaving”, Woodhead Publishing Limited, 2001.
3. Prabir Kumar Banerjee., “Principles of Fabric Formation”, CRC Press, 2014.
4. W.Klein, “New spinning systems”, The Textile Institute Manchester, U.K. 1993.
5. Broadbent D.A., “Basic Principles of Colouration”, Society of Dyers & Colourists, 2001.
6. D.J. Spencer., “Knitting technology”, Textile Institute Manchester, 2005.
7. A Vaidya, “Production of synthetic fibres”, Prentice Hall of India Pvt. Ltd., New Delhi, 1988.
8. A Ormerod, Modern preparation and weaving Machinery, Woodhead publishing Ltd, 2004
9. Ormerod.A., “Textile Project Management”, The Textile Institute, Manchester, New edition, ISBN: 1870812387, 2002.
10. Harold Carr and Barbara Latham, “The Technology of clothing manufacture”, 4th Edition Wiley-Blackwell, 2008

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P18TME0002	APPAREL PRODUCTION	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Analyze Pre- production activities in apparel industry CO2: Develop the pattern making, for Kids, Baby's, Men's and Women's wear CO3: Evaluate the Requirements and Methods of Marker planning and Cutting CO4: Create different types of Stitches & Seams on apparel as per end use. CO5: Evaluate different types of pressing and packing methods CO6: Design on pattern/cutting by CAD and Plant layouts/Flexible						
Course Assessment Methods						
DIRECT						
1. Midterm Examination 2. Assignment; Presentation 3. End Semester Examination						
INDIRECT						
1.Course-end survey						
Introduction to Indian Apparel Industry						9 Hours
Technical pack- Pre-production activities: types of samples and sample approval – Principles and advantages of Eight Head Theory- Body measurements - Techniques in pattern making - (i) Drafting (ii) Draping (iii) Flat pattern their advantages and disadvantages. Tools for pattern making						
Pattern Engineering						9 Hours
Set-in-sleeves: Plain, Puff, Bell, Bishop. Collars: Convertible, Shirt, Mandarin, Peter pan. Cuff: Shirt cuff, French cuff, and Contoured cuff. Drafting: Basic principles and Methodologies used to draft block patterns for the following garments: Shirt, Trousers, Skirts, Blouses, Nightwear						
Marker Planning						9 Hours
Requirements and Methods-Marker efficiency Advantages of computer aided marker planning. Spreading: Requirements and Methods-Types spreading and lay. Cutting: Objectives-methods cutting machines-Straight Knife-Round Knife-Band knife- Die cutting computer-controlled cutting-Lectra-Gerber-Tuka-Reach CAD.						

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Sewing Technology	9 Hours
Definition of Stitch and Seam- Types Stitch and Seam- Needles: Parts, sizes and classification- sewing threads - Stitch and seam defects.; sewing machinery and working aids. Feed systems.	
Fusing Technology	9 Hours
Means-equipment and Methods-Requirements- Pressing: Purpose Categories - Means- Equipment and methods-Pleating- Permanent press. Packing-Method-Components of packing- Trims and accessories-buttons Zippers-Velcro-Hook and eyehook and Bar- Fasteners-Closures- Lining Interlining-Wadding-Tapes-Elastic- Popular brands	
Total Hours: 45Hrs	
REFERENCES	
<p>1. Harold Carr and Barbara Latham, “The Technology of clothing manufacture”, 4th Edition Wiley-Blackwell, 2008.</p> <p>2. K.R. Zarapkar, “System of cutting”, Navneet Publications, Mumbai, 2005.</p> <p>3. Jacob Solinger, “Apparel Manufacturing Handbook”, Van Nostrand Reinhold Company, 1988.</p> <p>4. Hayden Peggall, “The Complete Dress Maker”, Marshal Cavendish, London, 1984.</p> <p>5. Laing R.M. and Webster J, “Fundamentals of stitches and Seams”, Textile Institute, 1998.</p> <p>6. Gerry Cooklin, Steven George Hayes and John McLoughlin, “Introduction to Clothing Manufacture”, Wiley-Blackwell, 2006</p>	

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P18TME0003	APPAREL TECHNOLOGY MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Evaluate the product life cycle and clothing product strategies.						
CO2: Analyse the clothing demand analysis and forecasting techniques.						
CO3: Apply the supply chain strategies in Apparel Industry.						
CO4: Create retail assortment and model stock plan.						
CO5: Design the Inventory model and apparel sourcing method						
CO6: Develop the merchandise planning for a Apparel Product						
Course Assessment Methods						
DIRECT						
1. Midterm Examination						
2. Assignment; Presentation						
3. End Semester Examination						
INDIRECT						
1.Course-end survey						
The Management of Clothing Products						9 Hours
Product concept -Classification of products-Clothing products: definition, occurrence and classification -Products mix: definition, features-Product life cycle (PLC) -Commercial product lifecycle -The process of developing new products-New product concept -Stages of developing new products -Particularities of the developing new clothing products-Clothing product strategies.						
Clothing Demand Analysis						9 Hours
Demand Management-Demand Forecasting-Forecasting Components-Forecasting process-Forecasting methods and Techniques-Apply various forecast research methods in preparation for developing, planning, purchasing, or merchandising apparel lines and collections. Qualitative AND quantitative forecasting technique- Case study and trend research in identifying fashion opportunities.						
Supply Chain Strategies in Apparel Industry						9 Hours
Industry Overview- Consumer Segments -Sales Channels-Supply Chain Structure -Trends and Drivers of Supply Chain- Sourcing Trends -Distribution Channels- Market Concentration-Supply Chain Challenges and Opportunities. Product Design and Launch-Merchandise Planning and Allocation-Sourcing and Production-Logistic.						
Retail Merchandise Management						9 Hours
Product management - Retail Assortment Planning -model stock plan, constraining factors, types of suppliers and selection criteria, category management, merchandise management planning in retail and export segments. New technologies and the impact on consumers' shopping experiences-Employees contribution to sales productivity and customer satisfaction in retail establishments.						
Apparel Sourcing and Inventory Management						9 Hours

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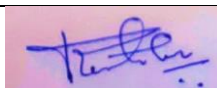
Sourcing concepts-Sourcing strategies-Lean and agile supply chains-Risk and benefits of single and multiple sourcing -Risk and benefits of local and global sourcing-Purchasing Process-Supplier selection-Supplier selection criteria-Methods for supplier selection-Decision Inventory models -decisions making-inventory replenishment, and seasonal and long-term replenishment strategies. Case study method to developing seasonal financial plans, creating store plans, and balancing multi-store inventories.

Total Hours: 45Hrs

REFERENCES


1. Susan Dillon, — The Fundamentals of Fashion Management, AVA Publishing (UK) LTd., 2012
2. Kathryn McKelvey and Janine Munslow, —Fashion Forecasting, Wiley – Blackwell, USA, 2008
3. Maurice J. Johnson & Evelyn C.Moore, —Apparel Product Development, Second Edition, Prentice Hall Upper saddle river, New Jersey, 2001.
4. Metha, P.L., —Managerial Economics Sultan Chand and Co.Delhi, 2007.
5. Doris H. Kincade, Fay Gibson, and Ginger Woodard —Merchandising Math: A Managerial Approac, Pearson Education, Inc. Published by Prentice Hall, 2004.

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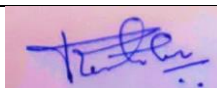
P18TME0004	STRATEGIC TECHNOLOGY MANAGEMENT IN THE TEXTILE COMPLEX.	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1. To understand conceptual and analytical framework of strategic management CO2. To study strategic management process CO3. To understand basic approaches in strategy formulation, implementation, evaluation and control. CO4. Analyse the Strategy Implementation CO5. Explain Strategic Evaluation and Control CO6. Explain Strategy Formulation						
Course Assessment Methods						
DIRECT						
1. Midterm Examination 2. Assignment; Group Presentation 3. End Semester Examination						
INDIRECT						
1.Course-end survey						
Introduction						9 Hours
Definition & nature of Corporate Planning, Advantages, and disadvantages, -Concept of strategy, levels at which strategy operates, strategic decision making, approaches to strategic decision making						
Strategic Management						9 Hours
Definition of strategic management, strategic management process, -Strategic intent: Vision, Mission, Goals and Objectives. -Environmental scanning and appraisal, Organizational appraisal, strategic advantage analysis						
Strategy Formulation						9 Hours
Corporate level strategies- Stability, Expansion, retrenchment, and Combination strategies - Business level strategies- Cost leadership, Differentiation and focus business Strategy -Strategic analysis and choice- Tools and techniques for strategic analysis, Arthur D Little Life Cycle Approach, SWOT analysis, Ansoff's Product - Market Matrix, Vulnerability Analysis, GAP analysis, Porter's five forces model, Value-chain analysis, Benchmarking, BCG Matrix, GE-9 Cell Matrix, TOWS Matrix, Grand Strategy Matrix, Mckinsey's 7'S framework.						
Strategy Implementation						9 Hours
Interrelationship of formulation and implementation, Resource allocation, Structures for strategies, strategic leadership, corporate culture, politics and power, Ethics and Social responsibility, Guidelines for a Successful Responsible Firm, Functional Strategies- Financial, marketing, personnel and operations plans and policies.						
Strategic Evaluation						9 Hours
Strategic Evaluation and Control Overview, Strategic Control, Techniques of strategic evaluation and control, Strategies for the Bottom of the Pyramid, Digitalisation strategies, Tailoring strategy to fit specific industry and company situation						
Total Hours: 45Hrs						

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REFERENCES


1. Strategic Management & Business Policy, AzarKazmi, Tata McGraw Hill, 3rd Ed. 2009.
2. Strategic Management, Concepts & Cases, Fred R. David, Pearson Education, 9th Ed.2005.
3. Competitive Advantage, Michael E. Porter, Free Press.
4. Globalisation, liberalisation and strategic Management, V. P. Michael, Himalaya Publishing House.
5. Crafting and Executing Strategy- The quest for competitive advantage, Concept & Cases-A.A. Thompson, A.J. Strickland, John E. Gamble, Arun K. Jain, Tata McGraw Hill-2010
6. Business Policy and Strategic Management, P. Subba Rao, Himalaya Publishing House

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P18TME0005	GLOBAL PERSPECTIVES IN TEXTILES SUPPLY CHAIN MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1. Describe the to Supply Chain Management CO2. Analyse the global Sourcing of textiles CO3. Analyse the logistics CO4. Explain the global Forecasting CO5. Explain the global Textile Supply Chain Management CO6. Analyse the demand Planning of textiles						
Course Assessment Methods						
DIRECT						
1. Midterm Examination 2. Assignment; Presentation 3. End Semester Examination						
INDIRECT						
1.Course-End survey						
Introduction to Supply Chain Management						9 Hours
SCM Activities-Managing Flows Through the Supply Chain-The Bullwhip Effect- Customer Focus- Spanning Nature of SCM- Intra-Organizational Integration- Cross-Enterprise Integration- SCM Versus Logistics - The Rise of SCM& Characteristics of a Competitive Supply Chain - Trends in SCM-The Lean Supply Chain-Managing Supply Chain Disruptions- Supply Chain Security- Sustainability and the “Green” Supply Chain.						
Global Sourcing of Textiles						9 Hours
What Is Sourcing-Purchasing, Sourcing, And Supply Management- Evolution Of The Sourcing Function- Commercial Versus Consumer Sourcing- Impact On The Organization And The Supply Chain - The Sourcing Function- The Sourcing Process-Cost Versus Price- Bidding Or Negotiation? - Sourcing And SCM- Functional Versus Innovative Products- Single Versus Multiple Sourcing- Domestic Versus Global Sourcing- Outsourcing- Electronic Auctions (E-Auctions)- Measuring Sourcing Performance						
Logistics						9 Hours
What Is Logistics? - The Logistics Function- Evolution of Logistics- Impact on the Organization- Impact on the Supply Chain- Reverse Logistics-Logistics Tasks- Transportation- Storage- Material Handling- Packaging- Inventory Control- Order Fulfillment- Facility Location & multimodal Transportation- Role of Warehouses in the Supply Chain-Cross-Docking.						
Global Forecasting & Demand Planning of Textiles						9 Hours
Forecasting Versus Planning- Impact on the Organization- Impact on Supply Chain Management- Principles of Forecasting- Steps in the Forecasting Process-Types of Forecasting Methods- Qualitative Forecasting Methods- Quantitative Forecasting Methods- Collaborative Forecasting and Demand Planning- Collaborative Planning, Forecasting and Replenishment (CPFR)- Sales and Operations Planning (S & OP)						
Global Textile Supply Chain Management						9 Hours
The Global Environment-Opportunities and Barriers-Factors Impacting Global Supply Chains-& Global Market Challenges-The Global Consumer-Global Versus Local Marketing-Cultural						

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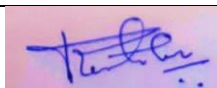
Challenges-& Global Infrastructure Design-Infrastructure Challenges-Role of Technology-& Cost Considerations-Hidden Costs-Non-Cost Considerations-& Political and Economic Factors-Impact of Exchange Rate Fluctuations-Regional Trade Agreements-Impact of Non-Tariff Barriers.

Total Hours: 45Hrs

REFERENCES

1. Supply Chain Management: A Global Perspective, Nada R. Sanders, ISBN: 978-0-470-14117-5, Wiley
2. Global Purchasing and Supply Management: Fulfill the Vision, Victor H. Pooler, David J. Pooler, Samuel D. Farney, Kluwer Academic Publishers Norwell, MA, USA ©2004, ISBN:140207816
3. Fashion Logistics: Insights into the Fashion Retail Supply Chain-By John Fernie, David B. Grant, Kogan Page Publishers, New Delhi.
4. International Supply Chain Management and Collaboration Practices edited by Wolfgang Kersten, Books on Demand
5. The Global Textile and Garments Industry: The Role of Information and Communication Technologies (ICTs) in Exploiting the Value Chain AninfoDev publication prepared by Enlightenment Economics Edited by: Kerry McNamara (infoDev) June, 2008.
6. Global Operations and Logistics: text and cases (Philippe-Pierre Dornier, Ricardo Ernst, Michel Fender &PanosKouvelis, Wiley.

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Professional Elective 2

Innovation and Technology


Professional Elective 2: Innovation and Technology		L	T	P	J	C
Course Code	Course					
P18TME0034	Applied Design Thinking	3	0	0	0	3
P18TME0035	Industrial Design & Development	3	0	0	0	3
P18TME0036	IPR Fundamentals and Patent Drafting	3	0	0	0	3
P18TME0037	Rapid Prototyping Fundamentals	3	0	0	0	3

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P18TME0034	APPLIED DESIGN THINKING	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Apply a scientific method to define & test various hypotheses to mitigate the inherent risks in product innovations.						
CO2: Demonstrate the learning to identify different beneficiaries & market segments, define the early adopters and choose the target user/buyer from the selected market.						
CO3: Design the solution [MUP] concept based on the proposed value defined for the target customer exploring various alternate solutions to achieve value-price fit.						
CO4: Develop skills in empathising, critical thinking, analysing, storytelling & pitching.						
Course Assessment Methods						
DIRECT						
1. Midterm Examination						
2. Other Assignments						
3. End Semester Project						
INDIRECT						
1.Course-End survey						
Customer-Centric Innovation						5 Hours
Introduction to Customer-Centric Innovations-Validation Risk vs Valuation Risk, The Innovators, learn the metrics that matter when evaluating the risk of innovations on the dimensions of Customer Commitment, Customer Acceptance & Customer Motivation to assess the success potential of product innovations.						
Problem Validation and Customer Discovery						10 Hours
Using tools and techniques of the managed innovation process toolkit (iTools), the Innovators understand the principles of design thinking for need-finding and use the innovation tools and techniques for problem validation and user discovery; learn to find the right buyer beneficiary and the use-case to solve.						
Value Proposition						10 Hours
Designing and Testing Value Proposition- The value proposition is the most critical part of the customer development process, a compelling value proposition which is quantified and validated will help you determine the Value-Price fit. The innovators learn the process, tools and techniques of Value Proposition Design and learn to build a compelling value proposition for their product/service						

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MUP Design	10 Hours
Solution Exploration, Concepts Generation and MUP design- The innovators are conceptualizing the solution concept must track their explorations and learnings while building the right prototype assessing the Capability, Usability and Feasibility. They learn the systematic concept generation process and evaluation of the concepts against a set of metrics.	
Right Pitch, Pitch Right	10 Hours
Using the 3Min Pitch Canvas as the primary template and tool, participants learn the art and science of pitching their startup ideas to the jury of experts.	
Total Hours: 45Hrs	
REFERENCES	
<ol style="list-style-type: none"> 1. The Startup Owner’s Manual: The Step-by-Step Guide for Building a Great Company”, by Steven Blank and Bob Dorf Value Proposition Design by Alexander Osterwalder 2. Product Design and Development - Book by Karl Ulrich and Steven D. Eppinger (Chapter 7- Concept Generation 	

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P18TME0035	INDUSTRIAL DESIGN & DEVELOPMENT	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO 1: Understand the product life cycle and management.						
CO 2: Sketch UI and UX for the product / prototypes						
CO 3: Build rapid prototypes using digital fabrication techniques.						
CO 4: Use hand and power tools for building mechanical design for prototypes						
Course Assessment Methods						
DIRECT						
1. Midterm Examination						
2. Other Assignments						
3. End Semester Examination						
INDIRECT						
1.Course-End survey						
Integrated Product Design and Development					12 Hours	
Product life cycle - Product design process - product requirement analysis - Design for manufacturability - design for testability - BoM Optimization & Alternate Vendor List - Optimization of Product parameters – Product Test Plan Generation - Product Testing, Validation and Qualification - Introduction to product design tools - QFD, Computer Aided Design – Product Enclosure, Thermal and Packaging analysis - Rapid Prototyping: Digital fabrication techniques - 3D printers - Hand and power tools for product development						
UI and UX [User Interface and User Experience]					12 Hours	
Fundamental concepts in UI & UX - Tools - Fundamentals of design principles - Psychology and Human factors for User Interface Design - Layout and composition for Web, Mobile and Devices - Typography - Information architecture - Colour theory - Design process flow, best practices in industry - User engagement ethics - Design alternatives						
Industrial Design 101					10 Hours	
Introduction to Industrial Design - Industrial design innovations - Product design animations - Case studies of Industrial design: iPod, iPhone						
Product Development Cycle					11 Hours	
Idea generation - Idea screening - Concept testing - Business analysis - Testing - Quality assurance – Managing the Program and risk analysis						
Total Hours: 45Hrs						
REFERENCES						
1. Integrated Product Design and Development: The product Realisation Process by Edward B. Magrab						
2. Industrial Design A-Z by Peter Fiell, Charlotte Fiell						
3. Hackernoon blogs on UI & UX						

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P18TME0036	IPR FUNDAMENTALS AND PATENT DRAFTING	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Have thorough knowledge on fundamental concepts of Intellectual Property.						
CO2: Take strategic decisions regarding commercialization of IP.						
CO3: Draft the Patent for a product						
Course Assessment Methods						
DIRECT						
1. Midterm Examination						
2. Other Assignments						
3. End Semester Examination						
INDIRECT						
1. Course-End survey						
Intellectual Property 101						15 Hours
Introduction and the need for Intellectual Property Rights - IPR Genesis and Development - Copyright - Trademark - Trade Secret - Geographical Indicators - Industrial Designs - Types of Patent – Sample Patent Application - IPR in INDIA & Global trends - Patent fees						
Prior Art Search & Case Studies of IPR						15 Hours
Prior Art Search - IP Licensing - IP Commercialization - International agreements - Patent enforcement - IP Infringement- Case Study on Apple vs Samsung, Case study on basmati rice, blackberry case						
Fundamentals of Patent Drafting						15 Hours
Invention as a concept - Keywords formation - Structure of patent - Key attributes in patent drafting - Drafting provisional specifications - Drafting complete specifications - Draft claims - Case studies on patent drafting						
						Total Hours: 45Hrs
REFERENCES						
1. P.N. Cheremisinoff, R.P. Ouellette and R.M. Bartholomew, Biotechnology Applications and Research, Technomic Publishing Co., Inc. USA, 1985						
2. D. Balasubramaniam, C.F.A. Bryce, K. Dharmalingam, J. Green and K. Jayaraman, Concepts in Biotechnology, University Press (Orient Longman Ltd.), 2002						
3. Bourgagaize, Jewell and Buiser, Biotechnology: Demystifying the Concepts, Wesley Longman, USA, 2000.						

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P18TME0037	RAPID PROTOTYPING FUNDAMENTALS	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Define the importance of prototyping for an intrapreneur in Product Development. CO2: Discover the appropriate approaches for rapid prototyping CO3: Develop product concepts and prototypes to test the idea						
Course Assessment Methods						
Direct						
1. Midterm Examination 2. Other Assignments 3. End Semester Examination						
Indirect						
2. Course End survey						
Introduction to Rapid Prototyping						7 Hours
Prototyping Basics- The Prototyping: Why, What & How? Rapid Prototyping, Rapid Prototyping & Start-up's, Limits of Prototyping, Rapid Prototyping Steps, Rapid Prototyping Types, Intrapreneur Life Cycle & Prototype						
Prototyping Techniques						10 Hours
Prototyping Techniques - Low fidelity prototype, High fidelity prototype, Paper Prototype & Examples, Wire framing & Tool based Prototype, Case Studies to showcase examples						
Digital Prototyping						10 Hours
Digital Prototyping - Conceptual Design, Interactive Design Tools, CAD Modelling & Tools foundations, Product Sketching, Additive Manufacturing, Design Principles and Patterns, Examples & Case Studies						
Hardware Prototyping						10 Hours
Hardware Prototyping- Introduction to EDA, Design & Simulation Tools, Architecture & Schematics basics, Introduction to Development Boards, Sensors, Actuators & Interfaces, Live Examples						
Prototype Validation						8 Hours
Prototype Validation, Defining Metrics that Matters, Test plan, Validation experiments of Prototypes						
Total Hours: 45 Hrs						
REFERENCES						
Rapid Prototyping and Manufacturing: Fundamentals of Stereolithography”, by Paul F. Jacobs						

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Professional Elective 3

Business Management


Professional Elective 3: Business Management		L	T	P	J	C
Course Code	Course					
P18TME0038	Supply Chain Management	3	0	0	0	3
P18TME0039	Nascent Market Strategies	3	0	0	0	3
P18TME0040	Organisation Behavior and Change Management	3	0	0	0	3
P18TME0058	Knowledge Management	3	0	0	0	3
P18TME0059	New Product Strategies	3	0	0	0	3
P18TME0043	Lean Six Sigma	3	0	0	0	3
P18TME0044	Finance for Engineers	3	0	0	0	3
P18TME0045	Digital Marketing	3	0	0	0	3
P18TME0046	Entrepreneurial Mindset & Methods	3	0	0	0	3

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18TME0038	SUPPLY CHAIN MANAGEMENT	L	T	P	J	C						
		3	0	0	0	3						
Course Outcomes												
After successful completion of this course, the students should be able to												
CO 1: Outline operations management environment and label the business information flows. CO 2: Contrast logistics and supply chain management and infer the increasing significance of logistics. CO 3: Model the elements of supply chain management and recall its recent trends. CO 4: Analyze impact of inventory on supply chain management and discuss its major issues. CO 5: List software packages involved in supply chain planning and model the various steps involved.												
Course Assessment Methods												
<table border="1" style="width: 100%;"> <tr> <td>DIRECT</td> </tr> <tr> <td>1. Mid Term Assessment</td> </tr> <tr> <td>2. Other Assignments</td> </tr> <tr> <td>3. End Semester Examination</td> </tr> <tr> <td>INDIRECT</td> </tr> <tr> <td>1. Course-End survey</td> </tr> </table>							DIRECT	1. Mid Term Assessment	2. Other Assignments	3. End Semester Examination	INDIRECT	1. Course-End survey
DIRECT												
1. Mid Term Assessment												
2. Other Assignments												
3. End Semester Examination												
INDIRECT												
1. Course-End survey												
Operations Management Basics						9 Hours						
Operations Management definition – Transformation Role – Organizational charts - Manufacture versus service organizations – growth of service sectors – Operations management decisions – Historical development – Operations Management environment – Business information flow.												
Logistics Overview						9 Hours						
Logistics versus Supply Chain Management – Contemporary Logistics terms – Logistics and Supply Chain Mission – Physical Distribution costs - Logistics Strategy and Planning – Logistics Strategy Triangle – Increasing significance of logistics – IT and Logistics.												
Supply Chain Management Overview						9 Hours						
Supply Chain Overview - Goals and Importance of Supply Chain Management -Flows in a Supply Chain – Typical Supply Chains –Elements of Supply Chain Management – Strategies for Supply Chain Management – Trends in Supply Chain management – Global concerns.												
Supply Chain Inventory						9 Hours						
Inventory and Inventory systems – Inventory positions in the supply chain – Reasons for inventories – Inventory and value – Functional roles of inventory – Reasons against inventory – Macro and micro issues in inventory management –Inventory management models - Planning supply chain activities.												

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Supply Chain Planning	9 Hours
Dynamics of material flow – Dynamics of order flow – Supply chain planning – definitions, processes and decisions – Software packages – Planning results – Supply Chain Design – Mass customization – Design for Logistics – Supplier Base design.	
Total Hours: 45Hrs	
REFERENCES	
<ol style="list-style-type: none"> 1. Janat Shah, Supply Chain Management – Text and Cases, Pearson Education, 5 th edition, 2012. 2. Sunil Chopra and Peter Meind l, Supply Chain Management-Strategy Planning and Operation, PHI Learning / Pearson Education, 5 th edition, 2012. <p>BOOKS:</p> <ol style="list-style-type: none"> 3. Ballou Ronald H, Business Logistics and Supply Chain Management, Pearson Education, 5 th edition, 2013. 4. David Simchi-Levi, Philip Kaminsky, Edith Simchi-Levi, Designing and Managing the Supply Chain: Concepts, Strategies, and Cases, Tata McGraw-Hill,3 rd edition, 2007. 5. Altekar Rahul V, Supply Chain Management-Concept and Cases, PHI, 3 rd edition, 2005. 6. Shapiro Jeremy F, Modeling the Supply Chain, Thomson Learning, Second Reprint, 2013. 7. Joel D. Wisner, G. Keong Leong, Keah-Choon Tan, Principles of Supply Chain Management A Balanced Approach, South-Western, Cengage Learning, 3rd edition, 2011 	

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P18TME0039	NASCENT MARKET STRATEGIES	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Acquaint students with the idea of a new product marketing process such as opportunity identification, concept selection, product design, pre-test, and test marketing, launching and profit management.						
CO2: Demonstrate the utility of formal models and approaches in addressing relevant problems involving new products with a greater focus on the use of these models.						
Course Assessment Methods						
DIRECT						
1. Midterm Examination						
2. Other Assignments						
3. End Semester Examination						
INDIRECT						
1.Course-End survey						
Product Marketing						10 Hours
Marketing overview, Introduction to various aspects of product marketing, market simulation exercises and case studies. Build, critique, and apply the B2B "buyer persona" to your enterprise or start-up business.						
Go-To-Market Plan						12 Hours
Understand the process of creating a Go-to-Market plan with clearly defined objectives, effective strategies and realistic tactics to accomplish them - Market entry strategies, new product, process & marketing strategies.						
Product Positioning						12 Hours
Product positioning and selling value, pricing models & strategies, Life value of customers, preference analysis & benefit segmentation.						
Branding Strategies						11 Hours
Craft effective product messaging for various stakeholders, managing brand & positioning strategies. Channel Management multiple channels, electronic channels, vertical marketing system. Marketing Metrics, Marketing Action Plan, Financial Projections, Marketing Budget. Controls & contingency planning						
						Total Hours: 45Hrs
REFERENCES						
1. Product Leadership: by Robert G. Cooper, Basic Books; ISBN: 046501433X; (2005).						
2. Marketing Engineering: Computer-Assisted Marketing Analysis and Planning, Revised Second Edition, by: Gary L. Lilien and Arvind Rangaswamy; Trafford Publishing ISBN: 1-4120-2252-5						
3. The Marketing Game, (2002) by Mason, Charlotte H. & William D. Perreault, Richard D. Irwin. (TMG!) Book with CD-ROM. THIRD Edition. McGraw-Hill.ISBN: 0072513802.						

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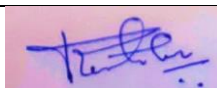
P18TME0040	ORGANISATION BEHAVIOR AND CHANGE MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Understand the concept of OB and application of OB frameworks						
CO2: Understand how people and groups in organisation behave, react, and interpret events in a workplace.						
CO3: Understand the theories, process, and models in Organisation development						
CO4: Analyse appropriate intervention techniques in the organizational context						
CO5: Design a simple intervention strategy to organizational situation						
Course Assessment Methods						
DIRECT						
1. Mid Term Assessment						
2. Other Assignments						
3. End Semester Examination						
INDIRECT						
1.Course-End survey						
Organisation Behavior						15 Hours
Introduction to OB – Focus and Purpose -Need, importance, Nature, Scope, Individual Behaviour – Attitudes: sources and changing attitude– Personality: personality traits; attributes influencing OB; Perception: process, distortion, changing perception – Motivation: Theories and techniques in practice. Group Behaviour -Organisation structure, Influence, Group decision making techniques, Team building, Interpersonal relations, communication.						
Organisation Change Management						15 Hours
Definition, Growth and Relevance of OD, Evolution of OD – Theories of Planned Change – OD Process Entering and Contracting, developing a Contract – Diagnosis – Need for Diagnostic Models, Organizational level, Group Level and individual Level Diagnosis – Diagnostic Information – Collecting, Analysing, Feedback, Survey Feedback						
Designing and Implementing Interventions						15 Hours
Human Process Interventions – Interpersonal and Group, and Organisational Process – Techno structural Intervention – Organisational Design and Restructuring, Work design and Responsibility Charting-Evaluating and Institutionalising OD Interventions-Evaluation Feedback, Measurement, Institutionalisation framework, Indicators of institutionalisation						
						Total: 45Hrs

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REFERENCES


1. Stephen P Robbins, Timothy A.Judge and Neharika Vohra, Organisational Behavior, Pearson Education, ISBN 9789332500334.FERENCES
2. Aswathappa K, 2014 Organisational Behaviour: Text, Cases & Game, Himalaya Publishing House, ISBN: 9789350515884
3. Donald R.Brown, An Experiential Approach to Organization Development, 8/e, Pearson, ISBN 9789332518339
4. Thomas Cummings, Christopher Worley Organization Development and Change, 10/e, Cengage, ISBN 1305143035, 9781305143036

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P18TME0058	KNOWLEDGE MANAGEMENT	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Demonstrate a thorough understanding of Knowledge Management Concepts						
CO2: Appreciate the importance of Knowledge Management and its implications to different businesses.						
CO3: Able to design and implement successful Knowledge Management systems						
CO4: Develop practical skills in the implementation and management of Knowledge Management practices across different business domains.						
CO4: Learn to Innovate with Knowledge Management and transform Knowledge Management with Artificial Intelligence / Machine Learning						
Course Assessment Methods						
DIRECT						
1. Mid Term Assessment						
2. Other Assignments						
3. End Semester Examination						
INDIRECT						
1.Course-End survey						
Introduction to Knowledge Management						9 Hours
Understanding Knowledge, Knowledge Attributes – Knowledge Management (KM) definitions, Evolution, Morphology of KM – Why KM – need for KM – Scope of KM – Drivers, Triggers, and opportunities for KM - evaluation of current trends in knowledge management						
Understanding Knowledge Management						9 Hours
KM Life cycle - KM Processes and Frameworks – Knowledge Creation, Sharing, Transfer - KM Practices and Strategies – Enabling conditions – Knowledge Audit – Knowledge Maps - Knowledge Discovery and Data Mining						
Technology in Knowledge Management						9 Hours
Knowledge Management System (KMS) – Tools and Technologies in building a KMS - Challenges in setting up a KMS – Risks, Security and Controls - Taxonomy – Content Management - Collaborative Technologies - KMS as Expert Systems – Business Intelligence and KM – Knowledge based organizations						
Driving Successful Knowledge Management						9 Hours
KM Maturity Models – KM Techniques – Enabling organisations to achieve sustainable competitive advantages - KM Culture – Driving engagement and managing change – Communities - KM Maturity and Measurement – Governance and Leadership - Role of CKO – KM Org Structure and Skillsets						
Transforming Knowledge Management With AI/ML						9 Hours

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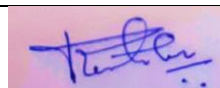
A case of KM Implementation – Best Practices in actualizing effective KM - KM and Innovation – Transforming KM with AI/ML – knowledge discovery and content intelligence – Recommendation systems - KM Analytics – Taking KM to the next level

Total Hours: 45Hrs

REFERENCES


1. Wellsprings of Knowledge: Building and Sustaining the Sources of Innovation by Dorothy-Leonard-Barton
2. Knowledge Management Tools and Techniques: Practitioners and Experts Evaluate KM Solutions, Madanmohan Rao
3. Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David Schum (2016), Knowledge Engineering: Building
4. Cognitive Assistants for Evidence-based Reasoning, Cambridge University Press
5. Davenport, T.H., Harris, J.G., 2007, Competing on Analytics: The New Science of Winning, Harvard Business School Press.
6. Becerra-Fernandez, I., Gonzalez, A., Sabherwal, R., 2004, Knowledge Management: Challenges, Solutions, and Technologies, Pearson Prentice Hall, ISBN: 0-13-101606-7.
7. Wenger, E. C. and W. M. Snyder, 2000, "Communities of practice: The organizational frontier." Harvard Business Review 78(1): 139.
8. Hansen, MT., Nohria, N., & Tierney, T., 1999, "What is Your Strategy for Managing a Knowledge", Harvard Business Review, 77(2).
9. Davenport, T.H., Prusak, Laurence, 1998, "Working Knowledge: How Organizations Manage What They Know", Harvard Business School Press.

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P18TME0059	NEW PRODUCT STRATEGIES	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Apply tools & techniques to identify new opportunities and develop new ideas						
CO2: Determine the layers in the design & development of the product, with specific classification on the requirements on software, hardware and integration.						
CO3: Explain the approach for any product/services throughout its lifecycle - discovery, development, manage & market						
CO4: Discuss the advantages of agile product development						
CO5: Develop a roadmap for a new innovative product and predict its evolution & growth.						
Course Assessment Methods						
DIRECT						
1. Mid Term Assessment						
2. Other Assignments						
3. End Semester Examination						
INDIRECT						
1.Course-End survey						
Understanding concept of New Product						10 Hours
How to Come Up with New Product Ideas - What is a New Product? Is it a New feature on an existing product? A new add-on to an existing product? A brand-new company? A sister product? Learn to understand, observe the market, client, the technology, and the limitations and solve an existing problem for people.						
Deep Dive into Solutions Components						10 Hours
Deep Dive into Solutions Components- Advantages and Disadvantages of a S/W only product, Open Source issues, IP Protection Issues, Cloud Vs. On-Premise - Advantages and Disadvantages of a H/W only product, issues of manufacturing, lead time, forecasting, Inventory, and supply chain - migration strategies from one to the other.						
Deep Dive into Business Solutions						10 Hours
Deep Dive into Business Solutions-Introduction to all 5 types: Product, PAAS, Service, Service-As-A-Result, Results only. Product: upfront recognition of revenue Vs. Delayed gratification. Product as a service: Reuse of product downstream. Service: Pay as you go, Time of use model, Downside of cost recovery. Service - as a - Results: Frictionless customer						
Which Strategy Is Right for You?						15 Hours
Which Strategy is right for you? Manage the operations across the entire supply chain from associating with the vendors, sourcing components to meet the requirements, handle delivery and logistic operations, identify and return defective parts, etc and also build stronger linkages with supply-chain to optimise working capital needs. Sense opportunities by identifying where profit will be as your industry evolves and determine which operations are critical to be done in-house and which operations can be outsourced.						
						Total Hours: 45Hrs


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REFERENCE
1. Founders at Work: Stories of Startups' Early Days" by Jessica Livingston Crossing the Chasm - A Book by Geoffrey Moore.


1. Founders at Work: Stories of Startups' Early Days" by Jessica Livingston Crossing the Chasm - A Book by Geoffrey Moore.

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P18TME0043	LEAN SIX SIGMA	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1. Explain the concepts of Lean six sigma CO2. Apply DMAIC tools for process improvement						
Course Assessment Methods						
DIRECT						
1. Mid Term Assessment 2. Other Assignments 3. End Semester Examination						
INDIRECT						
1.Course-End survey						
Problem Solving - Tools & Methodology					4 Hours	
Introduction to Lean Six Sigma, History and advantages, Fundamentals of Quality Management, Benefits, Introduction to QC tools, Application, Implementation						
Lean Tools					4 Hours	
7 Wastes, Identification of Muda, 5S, Poke Yoke, SMED, TPM, Value Stream Mapping - Kanban						
DMAIC Approach					10 Hours	
Introduction to DMAIC phases and approach, Define: Problem definition, improvement activity, opportunity for improvement, project goals, customer (internal and external) requirements, Measure: Parameter(s) considered to measure process performance, Analyse: Determination of root causes of variation or poor performance, Improve: Improvement in the process performance by addressing the root causes, Control: Process monitoring and control						
Statistical Quality Control					6 Hours	
Statistics concepts and measures, Measures of Central Tendency, Measures of dispersion, Descriptive approach - Properties of normal distribution, Charts and Box Plot Theory and application, Overview of SPC charts -X Bar & R Chart preparation						
Overview of Six Sigma					5 Hours	
Introduction to Six Sigma, Understanding Six Sigma, Implementing Lean Six Sigma						
- KAIZEN methodology						
DMAIC Methodology					5 Hours	
Define Phase: CTQ, Project Charter, Milestone, SIPOC, QFD Chart, Value Stream Map, Process Flow Diagram, Measure Phase: Ishikawa Diagram, Root cause analysis, Data Collection, Introduction to Minitab Software, Sigma Level Calculation, Analyze Phase: Statistical Hypothesis Testing for Mean, Variance and Proportions, Dealing with non-normal data, Regression Analysis, FMEA, Improve and Control Phase: SPC, Kaizen and Mistake Proofing						

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Statistical Analysis	6 Hours
Hypothesis tests - Test of independence, ANOVA (One way), Simple Regression and Multiple regression Analysis using Minitab	
Project	5 Hours
Application of DMAIC methodology, Report submission	
Total Hours: 45Hrs	
REFERENCES	
<ol style="list-style-type: none"> 1. Agile Project Management For Dummies Paperback – 4 May 2012 by Mark C. Layton 2. Agile Estimating and Planning (Robert C. Martin) Paperback – Illustrated, 1 November 2005 by Mike Cohn 3. Scrum Mastery: From Good to Great Servant Leadership Paperback – 1 June 2013 by Geoff Watts 	

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P18TME0044	FINANCE FOR ENGINEERS	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Critically evaluate project and prepare financial information in a clear accurate way.						
CO2: Demonstrate a critical understanding of the use of financial information for management decision making and control.						
CO3: Demonstrate the applicability of the concept of financial management to understand the managerial decisions and also to know the impact of cost of capital and capital structure.						
Course Assessment Methods						
DIRECT						
1. Mid Term Assessment						
2. Other Assignments.						
3. End Semester Examination						
INDIRECT						
1.Course-End survey						
Financial Statement						9 Hours
The terminology of understanding and the structure and control of the main financial statement used by business organisations – the role and use of different financial statements. -different techniques of financial statement analysis.						
Accounting Techniques						9 Hours
The use of Management accounting techniques for business planning and decision making – Business budgeting and budgetary control – applications of marginal costing,						
Financial Management						9 Hours
Financial management – objectives – scope – profit vs wealth maximisation – Time value of money- recent trends in primary and capital. - role and functions of financial administration						
Investment Appraisal Techniques						9 Hours
The use of investment appraisal techniques in business undertakings – pay back periods – Net present value – Internal rate of return - Average rate of return – Profitability index – capital rationing. - cost of capital – capital structure						
Working Capital						9 Hours
Management of working capital – sources of working capital – Estimation of working capital – Management of working capital – cash, receivables, and inventory management. - venture capital						
						Total Hours: 45Hrs
REFERENCES						
1. Shashi K.Gupta ; Management Accounting Principles and Practice , Kalyani publishers 13 th edition						
2. Pandey.I.M.; Financial Management, Vikas Publishing House Pvt Ltd,2015 edition						

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P18TME0045	DIGITAL MARKETING	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1. Summarise the Digital Marketing concepts CO2: Apply the Digital Marketing concepts in various business situations. CO3: Develop and implement effective digital marketing strategies in business organisation.						
Course Assessment Methods						
DIRECT						
1. Mid Term Assessment 2. Other Assignments 3. End Semester Examination						
INDIRECT						
1.Course-End survey						
Introduction to Digital Marketing					3 Hours	
Concepts, Key elements, Social media networking sites, characteristics & Implications of Digital Marketing						
Search Engine Optimizations					6 Hours	
Concepts, Benefits of SEO, Search Behaviour, Optimization process, Analysis and review						
Pay Per Click					5 Hours	
Concepts, Strength of pay per click, Keyword, Search Campaign Process, Analytics						
Digital Display Advertising					6 Hours	
Concepts, advantages & Disadvantages of digital display, Ad formats, campaign planning and budget, campaign tracking and optimization.						
E - Commerce					2 Hours	
Portals and Communities – tie ups						
Email Marketing					4 Hours	
Data Email Marketing Process, Design and Content, Delivery and Discovery						
Social Media Marketing					5 Hours	
Goals, channels – Face book, Twitter, LinkedIn, Google+, YouTube, insights and analytics						
Mobile Marketing					4 Hours	
Concepts, SMS content, SMS Strategy, Mobile App, Mobile Advertising						

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Digital Analytics	10 Hours
Dashboards, Bounce Rate, Site Speed, Site Search, Conversions, Real Time Reporting, Intelligence Reporting, Customized Reporting	
Total Hours: 45Hrs	
REFERENCE	
1. Ian Dodson (2016), The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns, New Jersey, John Wiley & Sons.	

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P18TME0046	ENTREPRENEURIAL MINDSET AND METHODS	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Develop an entrepreneurial mindset that will help them identify, assess, shape & act on opportunities in a variety of contexts & organisation.						
CO2: Practise effectual reasoning to drive entrepreneurial success.						
CO3: Assess the minds & methods of expert entrepreneurs to learn from their experience the lessons from failures & success.						
CO4: Demonstrate learning the entrepreneurial mindset and method by doing.						
Course Assessment Methods						
DIRECT						
1. Mid Term Assessment						
2. Other Assignments						
3. End Semester Examination						
INDIRECT						
1.Course-End survey						
Introduction					10 Hours	
Introduction to Innovation-led, tech-powered entrepreneurship- Practical proven tools for transforming an idea into a product or service that creates value for others- Differentiate bad ideas from good- Building a winning strategy, Defining the value proposition, preparing a business model, compare the innovation to existing solutions, build flexibility into their plan and determine to pivot/quit.						
Entrepreneurship Mindset					10 Hours	
Entrepreneurship mindset - dealing with unknown & unknown - Entrepreneurial mindset is critical to being successful as an entrepreneur- understanding of the attributes and perspectives of an entrepreneurial mindset, and the process to acquire. Concepts that enables a person to start a transformative process in the way they think generally, and in the way they think about business specifically.						
Effectuation					10 Hours	
Effectuation - The 5 principle of effectual entrepreneurship - principles and tools of causal reasoning, the exact inverse of the effectual reasoning that drives entrepreneurial success. In causal reasoning, it begins with a specific goal and a given set of means for reaching it but in effectual reasoning, it starts with only a set of means in the process of deploying them, and goals gradually emerge. Principles of effectuation as an approach to entrepreneurship and it shall help the students identify the next, best step to solve the problem that they are working on.						


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Experimentation	15 Hours
Learning from failures- Starting a technology powered innovation led enterprise comes with its share of risk. Hence it is important to read through many failure case studies and gain the knowledge to help them make better business decisions & to learn to learn from failures.	
Total Hours: 45Hrs	
REFERENCES	
<ol style="list-style-type: none"> 1. Required Textbook: “The Startup Owner’s Manual: The Step-by-Step Guide for Building a Great Company,” by Steven Blank and Bob Dorf 2. Effectuation: Elements of Entrepreneurial Expertise, by Dr.Saras Sarasvathy, New Horizons in Entrepreneurship series 	


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Professional Elective - 4
Information Technology


Professional Elective 4. Information Technology		L	T	P	J	C
Course Code	Course					
P18TME0047	Data Mining Techniques	3	0	0	0	3
P18TME0048	Data Science & Analytics with Python	3	0	0	0	3
P18TME0049	Data Visualization	3	0	0	0	3
P18TME0050	Big Data Technologies	3	0	0	0	3
P18TME0051	Block Chain Technology	3	0	0	0	3
P18TME0052	Artificial Intelligence	3	0	0	0	3

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P18TME0047	DATA MINING TECHNIQUES	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Explain the techniques for data pre processing.						
CO2: Apply association rules algorithm for correlation analysis						
CO3: Apply decision tree algorithm for classification.						
CO4: Apply Bayesian networks algorithm for classification.						
CO5: Apply various clustering algorithms for different datasets.						
CO6: Estimate the classifier accuracy with training, testing and cross validation datasets						
Course Assessment Methods						
DIRECT						
1. Midterm Examination						
2. Assignment; Presentation						
3. End Semester Examination						
INDIRECT						
1. Course-End survey						
Introduction to Data Mining and Preprocessing					9 Hours	
Data mining - Related technologies - Machine Learning, DBMS, OLAP, Statistics - Data Mining Goals - Stages of the Data Mining Process - Data Mining Techniques - Knowledge Representation Methods – Applications. Data preprocessing- Data cleaning- Data transformation - Data reduction - Discretization and generating concept hierarchies						
Classification Algorithms I					9 Hours	
Association rules: Basic idea: item sets - Generating item sets and rules efficiently - Correlation analysis Classification: Basic learning/mining tasks - Inferring rudimentary rules: 1R algorithm - Decision trees - Bayes Classification Methods - Rule-Based Classification - Model Evaluation and Selection - Techniques to Improve Classification Accuracy						
Classification Algorithms					9 Hours	
Bayesian Belief Networks - Classification by Back propagation - Support Vector Machines - Classification Using Frequent Patterns - k-Nearest-Neighbor Classifiers - Case-Based Reasoning- Multiclass Classification - Semi-Supervised Classification- Mining Time series Data, Periodicity Analysis for time related sequence data						
Clustering					9 Hours	
Basic issues in clustering - First conceptual clustering system: Cluster/2 - Partitioning methods: k-means, expectation maximization (EM) - Hierarchical methods: distance-based agglomerative and divisible clustering - Conceptual clustering: Cobweb						

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Outlier Detection	9 Hours
Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Proximity Based Approaches, Clustering-Based Approaches, Classification-Based Approaches, Mining Contextual and Collective Outliers, Outlier Detection in High-Dimensional Data	
Total Hours: 45Hrs	
REFERENCES	
1.Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Fourth Edition), Morgan Kaufmann, 2016	
2.Jiawei Han, MichelineKamber, Jian Pei, “Data Mining Concepts and Techniques”, Morgan Kaufman Publications, Third Edition, 2011.	
3.Pang-NingTan, Michael Steinbach, Vipin Kumar,” Introduction to Data Mining”, Pearson,2016. Gerry Cooklin, Steven George Hayes and John McLoughlin, “Introduction to Clothing Manufacture”, Wiley-Blackwell, 2006	

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P18TME0048	DATA SCIENCE & ANALYTICS WITH PYTHON	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Explain the roles and stages of data science projects						
CO2: Describe the data structures provided by NumPy library for arrays and vectorized computation						
CO3: Explain data structures provided by pandas library for data analysis						
CO4: Perform data wrangling, cleaning and transformation using python						
CO5: Use Matplotlib for plotting and visualizing the datasets CO6: Demonstrate data aggregation and time series analysis using python programming Language						
Course Assessment Methods						
DIRECT						
1. Midterm Examination						
2. Assignment; Presentation						
3. End Semester Examination						
INDIRECT						
1.Course-End survey						
Introduction to Data Science						5 Hours
Data science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation.						
NumPy Basic: Arrays						6 Hours
The NumPy Narray: A Multidimensional Array Object – Universal Functions: Fast Elementwise Array Functions – Data Processing Using Arrays						
Vectorization Computation and Pandas						7 Hours
File Input and Output with Arrays – Linear Algebra – Random Number Generation – Random Walks. Introduction to pandas Data Structures – Essential Functionality – Summarizing and Computing Descriptive Statistics – Handling Missing Data – Hierarchical Indexing – Other pandas Topics						
Data Loading, Storage, And File Formats & Data Wrangling: Clean, Transform, Merge, Reshape						9 Hours
Data loading, storage, and file formats: Reading and Writing Data in Text Format – Binary Data Formats – Interacting with HTML and Web APIs – Interacting with Databases – Data wrangling: clean, transform, merge, reshape Combining and Merging Data Sets – Reshaping and Pivoting – Data Transformation – String Manipulation – USDA Food Database						
Plotting and Visualization						9 Hours
A brief Matplotlib API Primer – Plotting Functions in pandas – Plotting Maps: Visualizing Haiti Earthquake Crisis Data – Python Visualization Tool Ecosystem						

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Data Aggregation and Group Operations & Time Series	9 Hours
Group by Mechanics – Data Aggregation – Group-wise Operations and Transformations – Pivot Tables and Cross-Tabulation TIME SERIES: Date and Time Data Types and Tools – Time Series Basics – Date Ranges, Frequencies, and Shifting – Time Zone Handling – Periods and Period Arithmetic – Resampling and Frequency Conversion – Time Series Plotting – Moving Window Functions – Performance and Memory Usage Notes	
Total Hours: 45Hrs	
REFERENCES	
1. Wes McKinney, "Python for Data Analysis", O'Reilly Media.2012 2. Sebastian Raschka, "Python Machine Learning", Packpub.com,2015 3. https://www.datacamp.com/courses/statistical-thinking-in-python-part-1	

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P18TME0049	DATA VISUALIZATION	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Explain principles of visual perception.						
CO2: Apply core skills for visual analysis						
CO3: Describe visualization for time-series analysis and ranking analysis.						
CO4: Explain visualization for deviation analysis and distribution analysis.						
CO5: Describe visualization for correlation analysis and multivariate analysis.						
CO6: Summarize issues and best practices in information dashboard design.						
Course Assessment Methods						
DIRECT						
1. Midterm Examination						
2. Assignment; Presentation						
3. End Semester Examination						
INDIRECT						
1.Course-end survey						
Core Skills for Visual Analysis						9 Hours
Information visualization – effective data analysis – traits of meaningful data – visual perception –making abstract data visible – building blocks of information visualization – analytical interaction – analytical navigation – optimal quantitative scales – reference lines and regions – trellises and crosstabs – multiple concurrent views – focus and context – details on demand – over-plotting reduction – analytical patterns – pattern examples.						
Time-Series, Ranking, And Deviation Analysis						9 Hours
Time-series analysis – time-series patterns – time-series displays – time-series best practices – part-to-whole and ranking patterns – part-to-whole and ranking displays – best practices – deviation analysis – deviation analysis displays – deviation analysis best practices.						
Distribution, Correlation, And Multivariate Analysis						9 Hours
Distribution analysis – describing distributions – distribution patterns – distribution displays – distribution analysis best practices – correlation analysis – describing correlations – correlation patterns – correlation displays – correlation analysis techniques and best practices – multivariate analysis – multivariate patterns – multivariate displays – multivariate analysis techniques and best practices.						
Information Dashboard Design						9 Hours
Information dashboard – Introduction– dashboard design issues and assessment of needs – Considerations for designing dashboard-visual perception – Achieving eloquence.						

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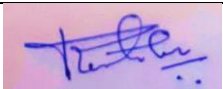
Graphics and Critical Design Practices	9 Hours
Advantages of Graphics _Library of Graphs – Designing Bullet Graphs – Designing Sparklines – Dashboard Display Media –Critical Design Practices – Putting it all together- Unveiling the dashboard.	
Total Hours: 45Hrs	
REFERENCES	
<ol style="list-style-type: none"> 1. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008. 2. Edward R. Tufte, "The visual display of quantitative information", Second Edition, Graphics Press, 2001. 3. Evan Stubbs, "The value of business analytics: Identifying the path to profitability", Wiley, 2011. 4. Gert H. N. Laursen and Jesper Thorlund, "Business Analytics for Managers: Taking business intelligence beyond reporting", Wiley, 2010. 5. Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013. 6. Stephen Few, "Information dashboard design: Displaying data for at-a-glance monitoring", second edition, Analytics Press, 2013. 7. Stephen Few, "Now you see it: Simple Visualization techniques for quantitative analysis", Analytics Press, 2009. 8. Tamara Munzner, Visualization Analysis and Design, AK Peters Visualization Series, CRC Press, Nov. 2014 	

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P18TME0050	BIG DATA TECHNOLOGIES	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Identify applications require big data technologies						
CO2: Explain Hadoop Architecture - HDFS, YARN and Map Reduce						
CO3: Perform administration and configuration of Hadoop Ecosystem						
CO4: Write basic queries and scripts in Hive and Pig						
CO5: Write advanced queries and scripts using hive and pig - aggregation, joins, sorting						
CO6: Discuss the need of HBase and write queries to use HBase as data source for Big Data						
Course Assessment Methods						
DIRECT						
1. Midterm Examination						
2. Assignment; Presentation						
3. End Semester Examination						
INDIRECT						
1.Course-end survey						
Introduction to Big Data						9 Hours
Introduction – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.						
Introduction to Hadoop						9 Hours
Big Data – Apache Hadoop & Hadoop Eco-System – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.						
Hadoop Architecture						9 Hours
Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., Name-Node, Secondary Name-Node, and Data-Node, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.						
Hadoop Ecosystem and Yarn						9 Hours
Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features – Name-Node High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN.						

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HIVE AND HIVEQL, HBASE	9 Hours
Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting and Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase concepts - Advanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.	
Total Hours: 45Hrs	
REFERENCES	
<ol style="list-style-type: none"> 1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015. 2. Chris Eaton, Dirk derooset al., "Understanding Big data", McGraw Hill, 2012. 3. Tom White, "HADOOP: The definitive Guide", O Reilly 2012. 4. Vignesh Prajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013. 5. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014. 6. http://www.bigdatauniversity.com/ 7. JyLiebowitz, "Big Data and Business analytics", CRC press, 2013. 	

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P18TME0051	BLOCK CHAIN TECHNOLOGY	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1 Discover the secure and efficient transactions with Bitcoin CO2 Identify and analyze the applications of Bitcoin script CO3 Experiment with Bitcoin mining CO4 Develop private Block chain environment and develop a smart contract on Ethereum CO5 Build the Hyperledger architecture and the consensus mechanism applied in the Hyperledger						
Course Assessment Methods						
DIRECT						
1. Midterm Examination 2. Assignment; Presentation 3. End Semester Examination						
INDIRECT						
1.Course-end survey						
Cryptocurrency and Blockchain - Introduction					9 Hours	
Cryptography and Cryptocurrency- Anonymity and Pseudonymity in Cryptocurrencies-Digital Signatures-Crypto currency Hash Codes. Distributed networks-Block chain- An Introduction Distinction between databases and Block chain- Distributed Ledger-Block chain ecosystem - Block chain structure- Block chain technology- Working -Permissioned and permission-less Block chain						
Bitcoin and Blockchain					9 Hours	
Bitcoin – history- Bitcoin- usage, storage, selling, transactions, working- Invalid Transactions- Parameters that invalidate the transactions- Scripting language in Bitcoin Applications of Bitcoin script- Nodes and network of Bitcoin- Bitcoin ecosystem						
Bitcoin Mining					9 Hours	
Purpose of mining- Algorithm used in mining- Mining hardware- Bitcoin mining pools- cloud mining of Bitcoin -Mining Incentives-Security and centralizations						
Ethereum					9 Hours	
The Ethereum ecosystem, DApps and DAOs - Ethereum working- Solidity- Contract classes, functions, and conditionals- Inheritance & abstract contracts- Libraries- Types & optimization of Ether- Global variables- Debugging- Future of Ethereum- Smart Contracts on Ethereum different stages of a contract deployment- Viewing Information about blocks in Blockchain Developing smart contract on private Blockchain- Deploying contract from web and consol						
Hyperledger					9 Hours	
Hyperledger Architecture- Consensus- Consensus & its interaction with architectural layers - Application programming interface- Application model -Hyperledger frameworks - Hyperledger Fabric -Various ways to create Hyperledger Fabric Blockchain network- Creating and Deploying a business network on Hyperledger Composer Playground- Testing the business network definition- Transferring the commodity between the participants						

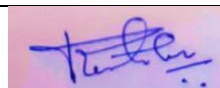
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Total Hours: 45Hrs

REFERENCES


1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, by Andreas M Antonopoulos 2018
2. Ethereum: Blockchains, Digital Assets, Smart Contracts, Decentralized Autonomous Organizations-2016.

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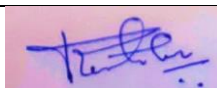
P18IME0052	ARTIFICIAL INTELLIGENCE	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Identify problems that are amenable to solution by AI methods.						
CO2: Identify appropriate AI methods to solve a given problem.						
CO3: Formalize a given problem in the language/framework of different AI methods.						
CO4: Implement basic AI algorithms.						
CO5: Summarize the need for AI in Robotics						
Course Assessment Methods						
DIRECT						
1. Midterm Examination						
2. Assignment; Presentation						
3. End Semester Examination						
INDIRECT						
1.Course-end survey						
Introduction to AI and Production Systems						9 Hours
Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics - Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.						
Representation Knowledge						9 Hours
Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.						
Knowledge Inference						9 Hours
Knowledge representation -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory						
Learning						9 Hours
Forms of learning – Knowledge in learning – Statistical learning methods –reinforcement learning, communication, perceiving and acting, Probabilistic language processing, perception.						
AI In Robotics						9 Hours
Robotic perception, localization, mapping- configuring space, planning uncertain movements, dynamics and control of movement, Ethics and risks of artificial intelligence in robotics						
Total Hours: 45Hrs						

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REFERENCES

1. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, Mc Graw Hill 2008
2. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007.
3. David Jefferis, “Artificial Intelligence: Robotics and Machine Evolution”, Crabtree Publishing Company, 19992
4. Peter Jackson, “Introduction to Expert Systems”, 3 rd Edition, Pearson Education, 2007.
5. Stuart Russel and Peter Norvig “AI – A Modern Approach”, 2 nd Edition, Pearson Education 2007.
6. Deepak Khemani “Artificial Intelligence”, Tata Mc Graw Hill Education 2013.
7. <http://nptel.ac.in>

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Professional Elective 5

Sustainability

Professional Elective 5: Sustainability		L	T	P	J	C
Course Code	Course					
P18TME0053	Environmental Sustainability	3	0	0	0	3
P18TME0054	Industrial Sustainability	3	0	0	0	3
P18TME0055	Supply Chain and Procurement Sustainability	3	0	0	0	3
P18TME0056	Textile Sustainability and Innovation	3	0	0	0	3
P18TME0057	Circular Economy for Enterprise Innovation	3	0	0	0	3

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P18TME0053	ENVIRONMENTAL SUSTAINABILITY	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Understand the drivers and enablers of Environmental Sustainability CO2. Appreciate the smartness in timeline and evolution of Sustainability CO3. Able to outline the various sustainable systems and methods to fight climate change CO4. Demonstrate critical thinking in implementation of sustainability in day to day activities. CO5. Understand the opportunities, challenges of Sustainability and how organizations and individuals should prepare to reap the benefits						
Course Assessment Methods						
DIRECT						
1. Midterm Examination 2. Other Assignments 3. End Semester Examination						
INDIRECT						
1.Course-end survey						
Introduction to Sustainability						5 Hours
Definition and Terminology – 3 dimensions of Sustainability – Circles of Sustainability – 7 modalities – Resiliency – Principals and Concepts – Scale and context – Consumption – Sustainability Development goals; Computational Sustainability						
International Framework on Sustainability						5 Hours
International Frameworks Global Reporting Initiative Sustainability standards – UN Global Compact (Communication on Progress) – The International Integrated Reporting Council (IIRC) International Framework on Sustainability – Reference Standards – ASTM Sustainability standards – United Nations Forum on Sustainability Standards – Dow Jones Sustainability Indices – Leadership in Energy and Environmental Design (LEED) – Global Sustainability Standards Boards by GRI.						
Challenges in Environment						15 Hours
Pollution – Air, Water, Land and Noise; Loss of Bio-diversity; Deforestation; Climate Change; Ozone depletion; Greenhouse gas emissions(GHG); Global Warming; Melting of Polar ice caps – Rise in sea water level; Degradation of Conventional Natural Resources; World Population Explosion; Ocean Acidification; Acid Rain; Waste Disposal – Landfills; Hazardous waste; Natural calamities; Extinction of Species – Endangered Species;						
Fighting Climate Change						20 Hours
Sustainable design; Micro-Sustainability; Sustainability and Systematic change resistance – Applied Sustainability; Carbon footprint – Sustainable Architecture – Sustainable Buildings – Green Buildings – Sustainable Urban Planning – Sustainable city – Smart city – Sustainable Living – Sustainable Transportation; Anti-consumption a part of sustainable lifestyle; Sustainable Agricultural Practices; Sustainability Sanitation; Computational Sustainability;						

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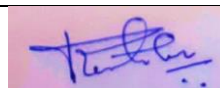
Sustainability in Businesses and Industries; Rain water Harvesting – Afforestation – Desiltation of ponds; ISO 50000 Environmental Management – Environmental Impact Assessment – Risk Assessment – Continuous Monitoring and Auditing – Contract Compliance services – Corporate Social Responsibility(CSR) Compliance – Clean Development Mechanism – Bioremediation – Carbon Trading – Water risk assessment – Water scarce areas – Water stress areas Measures and Technologies to reduce water consumption – Watershed Management; Social Governance – Sustainability claims – Eco labels – Sustainability certificates;

Total Hours: 45Hrs

REFERENCES


1. Rachel Carson, “Silent Spring”, Mariner books First Publication 1962.
2. David Wallace – Wells, “The Uninhabitable Earth: Life after warming”, Tim Duggan Books, 2019
3. Krishna Rubigha, “ISESR’s Handbook on Sustainability”, International Society for Energy and Sustainability Research, 2019.

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P18TME0054	INDUSTRIAL SUSTAINABILITY	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Understand the drivers and enablers of Industrial Sustainability						
CO2. Appreciate the advanced technologies in implementation of Industrial Sustainability						
CO3. Able to outline the various systems used in a Life Cycle Analysis						
CO4. Appreciate the power of Clean and Lean Manufacturing						
CO5. Understand the opportunities, challenges brought about by Corporate Social Responsibility and how organizations and individuals should prepare to reap the benefits						
Course Assessment Methods						
DIRECT						
1. Midterm Examination						
2. Other Assignments						
3. End Semester Project						
INDIRECT						
1.Course-end survey						
Introduction to Life Cycle Analysis						4 Hours
Goal Definition & Scoping – Inventory Analysis – Impact Assessment – Interpretation – Full Cost Accounting						
Clean & Lean Manufacturing						4 Hours
Pollution Prevention – Elimination of Downtime – Relation between Lean Manufacturing & Waste Reduction – Ambition of No waste						
Waste – Value Stream Mapping (VSM)						4 Hours
Identification of waste through VSM – Timelines – Material Lines – Future state maps						
Waste Management Hierarchy						4 Hours
Source Reduction & Reuse – Recycling & Compositing – Energy Recovery - Disposal						
Beyond Traditional 3R's						5 Hours
Reduce – Reuse – Recycle; New Age 3 R's – Rethink – Reject – Recover						
Energy Efficiency for Manufacturing						6 Hours
Economic Imperative – Energy Security – Environmental Impacts – Energy Efficiency Opportunities – Energy Auditing						
How Manufacturers Pay for Energy						5 Hours
Fuel Costs – Consumption charges – Demand charges – Transmission charges – Power Factor Adjustments – Fuel Adjustment Charges						
Corporate Social Responsibility						8 Hours
Stakeholder Theory – Institutional Theory – Partnerships with NGOs – Dow Jones Sustainability – FSTE4Good – Social Report & Accounting – Shift towards Environmental, Social and Corporate Governance (ESG)						
Industrial Sustainability Project						5 hours
Total Hours: 45Hrs						

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REFERENCES
1. Salah M. El -Haggar, "Sustainable industrial Development and Waste Management", Elsevier, 2007. 2. Gabriele Ibrahim, "Sustainability in Manufacturing Enterprises," Springer, 2016

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P18TME0055	SUPPLY CHAIN AND PROCUREMENT SUSTAINABILITY	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Understand the drivers and enablers of Supply chain Sustainability						
CO2. Appreciate the smartness in FMCG Supply chain, Inventory and Logistics						
CO3. Able to outline the various sustainable systems used in a manufacturing industry						
CO4. Appreciate the power of carbon strategies to fight climate change						
CO5. Understand the opportunities, challenges brought about by Supply chain and Procurement Sustainability and how organizations and individuals should prepare to reap the benefits						
Course Assessment Methods						
DIRECT						
1. Midterm Examination						
2. Other Assignments						
3. End Semester Examination						
INDIRECT						
1. Course-end survey						
Introduction to Supply Chain Management						9 Hours
Fundamentals of Supply chain – Customer Management processes – Demand Management Processes - Supply chain structure design – Supply chain uncertainty – Supply chain complexity – Evaluation of Supply chain strategy – Information flow design – Risk and Resilience development in Supply chains – Integration of Sustainability with Supply chain procurement.						
Green Purchasing Fundamentals						9 Hours
Design for environment principles - International green labelling – Ecolabels – Green Information systems – Green product standards -Environmentally preferred purchasing - Green purchasing program development – Principles and standards for Procuring sustainably – BS 8903 – ISO 20400 – Drivers for Sustainable Procurement – Setting Sustainable Procurement Priorities – Sustainable Procurement Plan and Policy – Sustainable Risk assessment – Adoption of sustainable practices in Product design – Ethical Sourcing – Manufacturing – Packaging – Transportation – Warehousing and storage – Wholesale and retail trade – Consumption and customer service – End use – Green reverse logistics.						
Carbon Strategies						9 Hours
Climate strategy and Carbon policy - Supporting GHG emission reduction - Tools for tracking emissions – Carbon Mapping – Carbon footprint – Logistics and Transport Sector Carbon footprint – Total supply chain Carbon footprint – Assessing Value chain emissions – Carbon Emissions Modelling – ISO 14000 – Emission Vs Performance –Emission laws – Waste management – Closed Loop Supply Chain – Concepts and Characteristics – Carbon efficient supply chains – Supply chain decarbonization – Enabling Low Carbon Production – Optimized Networks – Energy Efficient Buildings – Packaging design initiatives – Modal Switches in Transportation – Nearshoring – Carbon Offsetting – Increased Home Delivery – Carbon labelling.						

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Green Logistics and Transportation	9 Hours
Logistical factors in green Transportation - Energy efficiency in 3PL operations – EPA smart-way program – Changing Internal Company Practices – Impacting Supply chain practices – Environmental Logistic Performance Index – Oil intensity – Emissions Intensity – Transportation modes – Green Transportation Challenges – Reverse Logistics – Renewable Energy & Biofuels – Hybrid Vehicles.	
Selection Criteria for Sustainable Vendors	9 Hours
Sustainable selection criteria – Supplier pre-qualification – Criteria for proposal/tender evaluation – Whole life costing techniques – Developing Key Performance Indicators (KPI) – Upstream partners – Downstream partners – Economic, Social, Environmental and Financial Factors.	
Total Hours: 45Hrs	
REFERENCES	
1. Joelle Moranna, “Sustainable Supply Chain Management,” Wiley books, 2013. 2. Bouchery, Y., Corbett, C.J., Fransoo, J.C., Tan, T. (Eds.): Sustainable Supply Chains: A Research based text book on Operations and Strategy	

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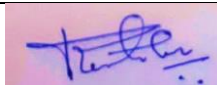
P18TME0056	TEXTILE SUSTAINABILITY AND INNOVATON	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Demonstrate a thorough understanding of Sustainable Textile Concepts CO2: Appreciate the importance of Sustainable Textile and its implications to different businesses. CO3: Be able to design and implement successful Sustainable Textile systems CO4: Develop practical skills in the implementation and management of Sustainable Textile practices across different business domains. CO4: Learn to Innovate with Sustainable Textile CO5: Transform Sustainable Textile with Artificial Intelligence / Machine Learning						
Course Assessment Methods						
DIRECT						
1. Midterm Examination 2. Other Assignments 3. End Semester Project						
INDIRECT						
1.Course-end survey						
Introduction to Sustainable Fashion					3 Hours	
Agendas of Sustainable Fashion – Social Agenda – Economic Agenda – Economic agenda – Cultural Agenda; Critical Planetary Boundaries – Sustainable Development Goals						
Hazard Assessment of Effect & Process Chemicals					7 Hours	
Behaviour of Textile Chemicals in Waste water and Sewage sludge treatment – Waste water relevant characteristics of textile chemicals – Biodegradability or eliminability of textile chemicals						
Usage and Production of Fibre From Renewable Sources					7 Hours	
Manmade Cellulosic fibres – Synthetic Fibres from Vegetable oil/starch – Biopolymers – Production Modification – Usage of Textile Chemicals from Biopolymers – Biofuel based Auxiliaries – Natural dyestuffs.						
Certifications / Eco-Labels					10 Hours	
Voluntary Certification Schemes for Textile raw materials, textile chemicals and textile products – Cradle to Cradle – Bluesign – Global Organic Textile Standard (GOTS) – OEK – TEX 100 – Biopreffered;						
Designing of Sustainable Fashion					10 Hours	
Concepts & Approaches – Dematerialization – Durability – Zero waste – Disassembly – Up-cycling – Mon-materiality.						
Textile Sustainability and Innovation Project					8 Hours	
Total Hours: 45 Hrs						

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REFERENCES


1. Muthu, Subramanian Senthilkannan, Gardetti, Miguel Ángel, “Sustainability in the Textile and Apparel Industries: Sustainable clothing, Clothing Design and Repurposing”, Springer, 2020.
2. Kate Fletcher, “Sustainable Fashion and Textiles: Design Journeys,” Earthscan, 2008

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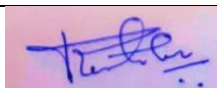
P18TME0057	CIRCULAR ECONOMY FOR ENTERPRISE INNOVATION	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
After successful completion of this course, the students should be able to						
CO1: Demonstrate a thorough understanding of Circular Economy Concepts						
CO2: Appreciate the importance of Circular Economy and its implications to different businesses.						
CO3: Be able to design and implement successful Circular Economy systems						
CO4: Develop practical skills in the implementation and management of Circular Economy practices across different business domains.						
CO4: Learn to Innovate with Circular Economy						
CO5: Transform Circular Economy with Artificial Intelligence / Machine Learning						
Course Assessment Methods						
DIRECT						
1. Midterm Examination						
2. Other Assignments						
3. End Semester Project						
INDIRECT						
1.Course-end survey						
Introduction to Circular Economy					5 Hours	
Business Value in Circular Economy – Longer Lasting Products – Remanufacturing – Thinking in systems						
Design for The Future					5 Hours	
Design out waste – Design for cyclability – Design for durability						
Incorporate Digital Technology					5 Hours	
Data & Insights – Digital Platform						
Stretching the Lifetime					5 Hours	
Maximise lifetime of products – INUSE; Maximise lifetime of products - AFTERUSE						
Collaborate to Create Joint Value					5 Hours	
Industry Collaboration – Customer/Consumer Collaboration – Government Collaboration – Internal Collaboration – Community Collaboration						
Priortise Regenerative Resources					5 Hours	
Regenerative Materials – Regenerative Water – Regenerative Energy						
Use Waste as A Resource					5 Hours	
Valorise waste streams – Closed Loop; Valorise waste streams – Open Loop – Energy Recovery from waste						
Rethink Business Model					5 Hours	
Product Business Models – Service Business Models						
Circular Economy for Enterprise Innovation Project					5 Hours	
Total Hours: 45 Hrs						

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REFERENCES:

1. Walter R. Stahel, "The Circular Economy – A user's guide," Routledge, 2019
2. Ken Webster, "The Circular Economy: A Wealth of Flows – 2nd Edition," EllenMacArthur Foundation, 2015

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