



University of Mumbai

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)

(Under TCET-Autonomy Scheme-2020)



Estd. in 2001

Conferred Autonomous Status by University Grants Commission (UGC) for 10 years w.e.f. AY 2019-20

ISO 9001:2015
Certified
Institute

NBA
Accredited
Programs

NAAC Accredited
Institute
with 'A' Grade

AICTE-CII Survey rating
in Platinum category for
Industry linkages

Among Top 250
Colleges in NIRF
Ranking

68th & 78th in All India Rank by Outlook
survey published in June 2019 &
May 2018 respectively

Open Elective Syllabus under Autonomy
(w.e.f. Academic Year 2020-2021 onwards)

B.E. Semester VI to VIII : CBCGS-H 2019

Lagdu Singh Charitable Trust's (Regd.)

THAKUR COLLEGE OF ENGINEERING & TECHNOLOGY

Autonomous College Affiliated to University of Mumbai

Approved by All India Council for Technical Education(AICTE) and Government of Maharashtra

A - Block, Thakur Educational Campus, Shyamnarayan Thakur Marg, Thakur Village, Kandivali (East), Mumbai - 400 101 • Tel.: 022-6730 8000 / 8106 / 8107 Telefax: 022-2846 1890
Email: tcet@thakureducation.org • Website: www.tcetmumbai.in www.thakureducation.org



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VISION

Thakur College of Engineering and Technology will excel in Technical Education to become an internationally renowned premier Institute of Engineering and Technology

MISSION

To provide state-of-the-art infrastructure and right academic ambience for developing professional skills as well as an environment for growth of leadership and managerial skills to students which will make them competent engineers to deliver quality results in the industry

CORE VALUES

- Integrity & Accountability
- Respect for each Individual
- Sensitive towards Social Responsibilities
- Unfettered spirit of learning, Exploration, Rationality & Enterprise
- Exploration & Enterprise for both Faculty and Students

CORE COMPETENCIES

- Structured & Guided Teaching Learning Methodology Maintaining Academic Rigor
- System - Driven - Student - Centric Services
- Proactive Student Professional and Personality Development Programmes
- State - of - the - art Infrastructure meeting International Standards



B.E. CBCGS- H 2019: Open Electives under TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

Introduction

The open electives are designed to allow flexibility to the learners to select an elective from the list offered by all departments of the institute. The cafeteria approach introduced by the University Grant Commission (UGC) to facilitate all round development and promote inter-disciplinary, intra-disciplinary courses according to their learning needs, interest and aptitude. TCET offers a basket of 24 courses, with three courses each offered by the six departments. Every student should earn 12 credits by selecting four open elective courses from the following list offered by the departments in semester VI, VII and VIII (1 in sem VI & sem VII along with 2 in sem VIII). These courses are selected in line with the recommendations in the report “Evaluation Reforms in Higher Education Institutions” published by the University Grant Commission in November 2019.

Procedure

An orientation session for open electives will be conducted at the beginning of semester VI, VII and VIII for creating awareness and understanding of course content, its relevance and importance. The orientation session will enable students to make informed choices about electives. Students will be given an option form for selection of electives. Students shall have to select the elective of their choice and submit the completed registration form. The open elective courses that are offered will be subject to minimum class strength specified from time to time.

Open Elective Syllabus (SEM VI to SEM VIII)

Sr	SEM -VI Open ELECTIVE-I Page Numbers : 2-19	SEM-VII Open ELECTIVE-II Page Numbers : 20-39	SEM-VIII Open ELECTIVE-III Page Numbers: 40-56	SEM VIII Open ELECTIVE-IV Page Numbers: 57-76
1	OEC 6011 : Digital Marketing	OEC 7011 :Management Information System	OEC 8011:Project Management	OEC 8021: Managerial Economics
2	OEC 6012 :Software Process Automation	OEC 7012 :Human Resource Management	OEC 8012:Energy Audit and Management	OEC 8022: Digital Business Management
3	OEC 6013 :Entrepreneurship development and management	OEC 7013 :Design Thinking and Problem Solving	OEC 8013:Innovation Management	OEC 8023: Social Network Analysis
4	OEC 6014 :Cyber Security and Laws	OEC 7014 :Disaster management and mitigation measures	OEC 8014:Environment management	OEC 8024: Taxation for Engineers
5	OEC 6015 :Reliability Engineering	OEC 7015 :Research Methodology	OEC 8015:Intellectual Property Rights (IPR) & Patenting	OEC 8025: Product Design and Development
6	OEC 6016 :Product life cycle management	OEC 7016 :Operation Research	OEC 8016:Supply Chain Management	OEC 8026: Development Engineering



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Open Elective- I for T.E. Semester –VI
Choice Based Credit Grading Scheme with Holistic Student Development
(CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)



T.E. Semester –VI

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)

TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B. E. Course					T.E. Open Elective (SEM : VI)				
Course Name: Digital Marketing					Course Code: OEC- 6011				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	100
3	-	-	3	3	25	75	-	-	
<p>IA: In-Semester Assessment- Paper Duration – 1.5 Hours ESE : End Semester Examination- Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</p>									
Prerequisite: Marketing Fundamentals, Digital Assets, Digital System Setup and automation									

Course Objective: The course will transform you into a complete digital marketer with expertise in the top eight digital marketing domains — search engine optimization, social media, pay-per-click, conversion optimization, digital analytics, content, mobile, and email marketing. Fast-track your career in digital marketing today with practical training you can apply on the job.

Course Outcomes: Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand Digital Business Models	L1,L2
2	Understand A.I. and machine learning terminologies, mind-set and its application in marketing	L1,L2
3	Build sophisticated machine learning models – learn how to gather and clean data, select an algorithm, train, evaluate and deploy a model	L1,L2
4	Predict churn, sales or score leads with tools	L1,L2,L5
5	Segment customers; build clustering models to drive personalization.	L1,L2,L5,L6
6	Build computer vision models for social visual listening, use natural language processing to predict consumption preferences.	L2,L5



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Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction - Digital Marketing	7	L1,L2
	Digital Marketing Skills empowered by AI :SEO, Search Engine Marketing, Social Media Marketing, Web Analytics, Email Marketing, Content Marketing, Influencer Marketing, Conversion Rate Optimization, Tools Based Marketing, Lifecycle Marketing Automation.		
2	Full Funnel Marketing	8	L1,L2
	Acquisition: Content marketing, landing page testing, campaign optimization, conversion rate optimization, lead scoring, competition and trend analysis, predict sales, optimize product pricing, programmatic media buying, segmentation and clustering for targeting, personalization. Activation: Personalization, psychographic segmentation, behavioral segmentation Retention : Predict churn, customer care chatbot, sentiment analysis, visual social listening, personalization Revenue: Predict and maximize customer lifetime value, recommender systems, market basket analysis Referral : Predict whether user recommend your product		
3	Marketing framework and tools	8	L1,L2
	Planning: Hubspot, Brightedge, Node, Crayon, Equals3, Marketmuse, Pathmatics, Calibermind, Alegion, Netra Production : Acrolinx, Narrative Science,Clarifai, GumGum, phrasee, curate Attentioninsight Personalization : Uberflip, Klevu, Seventh Sense, Blueshift, Promotion : Yext, Albert, Onespots, Cortex, Sifrock, inPowered, Performance : Monkeylearn, PaveAI,		
4	Predictive Analytics	7	L1,L2,L5
	Fundamentals of predictive analytics,Prediction model for lead scoring and sales forecasting, churn prediction model, Predictive modelling for customer behaviour, automated segmentation		
5	Psychographics, NLP and Computer Vision	7	L1,L2,L5,L6
	Customer psychographics, leveraging personality traits to predict consumption preferences using NLP, Detect emotions, assign labels, understand text from images, detect news events, logos using Computer Vision		
6	Futuristic Marketing	8	L1,L2,L3,L4,L5
	IoTs Augmented Reality, Virtual Reality and XR for Marketing, Blockchain and smart contracts for marketing, NeuroMarketing, Wearable Tech, Personal Chatbots		
Total Hours		45	



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Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Artificial intelligence marketing and predicting consumer choice: an overview of tools and techniques	Struhl, S.	Kogan Page Publishers	Third	2017
2	AI for Marketing and Product Innovation: Powerful New Tools for Predicting Trends, Connecting with Customers, and Closing Sales.	Appel, A., Sthanunathan, S., Pradeep, A. K.	Wiley.	Third	2018
3	Artificial intelligence for marketing: practical applications	Sterne, J.	John Wiley & Sons	Fourth	2017..
4	Using Artificial Intelligence in Marketing: How to harness AI and maintain the competitive edge.	King, K.	Kogan Page Publishers	First	2019

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	https://www.iimcal.ac.in/	https://iimcal.talentsprint.com/ai-powered-marketing/index.html?utm_source=googlesearch&utm_medium=cpc&utm_campaign=iimc-aipm-googlesearch-india&utm_content=ai-in-marketing-by-iimc&gclid=CjwKCAjwyo36BRAXEiwA24CwGVQrXnOTpcARRsFtv8b9VAPqwV7KGPfMpyx36i1Zafl_7Br1OJEEhoChC4QAvD_BwE/	M1,M2,M3, M4,M5,M6
2	https://www.coursera.org/	https://www.coursera.org/learn/uva-darden-market-analytics	M4,M5,M6
3	https://academy.hubspot.com/	https://academy.hubspot.com/courses/artificial-intelligence-and-machine-learning-in-marketing?_hstc=89107140.de4401799f3edce1fd42a1704a37ab4a.1598174195879.1598174195879.1598174195879.1&_hssc=89107140.1.1598336323938&_hsfp=3825083997&hsCtaTracking=e4d097a0-ed0c-4f82-8e93-e9016ea31749%7C00439f3d-17bf-4431-af12-50a507004fcd	M1,M2,M3, M4,M5,M6



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T.E. Semester –VI

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TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. Course					T.E. Open Elective SEM : VI				
Course Name : Software Process Automation					Course Code : OEC- 6012				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	100
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration – 1.5 Hour ESE: End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Object Oriented Programming, Frontend Backend connectivity									

Course Objective: The objective of the course is to introduce to the students about the integration people involved in the software process with the development and tools required for automation of the project development.

Course Outcomes: Upon completion of the course students will be able to:

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the importance of process automation and models of software process	L1, L2
2	Analyze the security and configuration management	L1, L2, L3,L4
3	Understand and apply the build concepts using a build tool	L1, L2, L3,L4
4	Understand the testing concepts and apply them to the project	L1, L2, L3,L4
5	Identify the activities in agile project management and use a tool for the same	L1, L2, L3,L4
6	Understand and identify the various principles of quality assurance	L1, L2, L3,L4



Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction to process Automation	6	L1, L2
	Importance of process automation, types of models, prescriptive and descriptive models, Devops model, process modelling objectives and goals		
2	Automation of config management	8	L1, L2, L3,L4
	Overview of configuration management, Github and git tool		
3	Build automation	4	L1, L2, L3,L4
	Overview of build management, Jenkins tool for build management		
4	Test automation	8	L1, L2, L3,L4
	Overview of testing concepts, test cases , selenium tool		
5	Project management	8	L1, L2, L3,L4
	Project management concepts, agile team, Atlassian jira project management tool		
6	Quality management	11	L1, L2, L3,L4
	Quality concepts and metrics, CMMI, ISO, spice, six sigma, Total Quality management		
Total Hours		45	

Books and References:

	Title	Authors	Publisher	Edition	Year
1	The DevOps handbook	Gene Kim, Jez Humble, Ptryk Debois & John Willis	IT revolution Press	first Edition	2016
2	Selenium WebDriver 3 Practical Guide: End-to-end Automation Testing for Web and Mobile Browsers with Selenium WebDriver	Satya Avasarala	Packt Publishing Ltd,	Second Edition	2018

Online Resources:

S. No.	Website Name	/URL	Modules Covered
1	www.researchgate.com	https://www.researchgate.net/publication/258865356_Software_Process_Definition_and_Management	M6



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TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. Course					T.E. Open Elective SEM : VI				
Course Name : Entrepreneurship Development and Management					Course Code : OEC- 6013				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	100
3	-	-	3	3	25	75	-	-	
<p align="center">IA: In-Semester Assessment - Paper Duration – 1.5 Hour</p> <p align="center">ESE: End Semester Examination - Paper Duration - 3 Hours</p> <p align="center">The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</p>									
Prerequisite: Object Oriented Programming, Frontend Backend connectivity									

Course Objective: To acquire necessary knowledge and skills required for organizing and carrying out entrepreneurial activities, to develop the ability of analyzing and understanding business situations in which entrepreneurs act and to master the knowledge necessary to plan entrepreneurial activities. The objective of the course is, further on, that the students develop the ability of analyzing various aspects of entrepreneurship – especially of taking over the risk, and the specificities as well as the pattern of entrepreneurship development and, finally, to contribute to their entrepreneurial and managerial potential

Course Outcomes: Upon completion of the course students will be able to:

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Describe the opportunities in Entrepreneurship in the context of Globalization and Liberalization	L1, L2
2	Discover skills to succeed as an entrepreneur	L1, L2, L3
3	Comprehend enterprises establishment process	L1, L2
4	Acquaint with the role of various agencies promoting Entrepreneurship development	L1, L2
5	Select the optimum financial and human resource management plan for an enterprise	L1, L2, L3, L4
6	Integrate the skills to develop a business plan to start a small enterprise	L1, L2, L3, L4, L5, L6



Detailed Syllabus:

Module	Sub-Module / Contents	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	Entrepreneurship	9	L1, L2, L3
	Introduction – Meaning & Definition of Entrepreneurship, Entrepreneur & Enterprise – Differences between Entrepreneurship, Entrepreneur & Enterprise – Functions of Entrepreneur – Role of Entrepreneur for Economic Development - Factors influencing Entrepreneurship - Pros and Cons of being an Entrepreneur – Differences between Manager and Entrepreneur – Qualities of an Entrepreneur – Types of Entrepreneurs. Entrepreneurship Development- Need – Problems – National and State Level Institutions		
2	Small Scale Industries	8	L1, L2
	Small Scale Industries - Tiny Industries - Ancillary Industries - Cottage Industries – Definition – Meaning - Product Range - Capital Investment - Ownership Patterns - Importance and Role played by SSI in the development of the Indian Economy - Problems faced by SSI's and the steps taken to solve the problems - Policies Governing SSI's		
3	Creativity	7	L1,L2,L3
	Creativity and entrepreneurship, Steps in Creativity, Innovation and inventions: Using left brain skills to harvest right brain ideas and Legal Protection of innovation, Skills of an entrepreneur, Decision making and Problem Solving (steps indecision making)		
4	Costing	7	L1, L2, L3, L4, L5
	Concept of Cost, Classification of Cost, Use of Cost Data, Marginal Costing: Cost-Volume Profit Relationship, Mathematical Relationship between Cost-Volume Profit, Margin of Safety, BEP Analysis : Graphical Analysis, Use of Marginal costing in decision making- pricing decision, make or buy etc.		
5	Preparing the Business Plan	7	L1, L2, L3, L4
	Business Plan, Importance of BP, Preparation of BP, Typical BP format - Financial aspects of the BP - Marketing aspects of the BP - Human Resource aspects of the BP - Technical aspects of the BP – Social aspects of the BP - Common pitfalls to be avoided in preparation of a BP		
6	Starting a Small Industry	7	L1, L2, L3,



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	<p>Concept of Business opportunity, scanning the environment for opportunities, evaluation of alternatives and selection based on personal competencies. - An overview of the steps involved in starting a business venture – Location, Clearances and Permits required Formalities, Licensing and Registration Procedures - Assessment of the market for the proposed project - Importance of financial, technical and social feasibility of the project.</p>		L4, L5, L6
	TOTAL	45	



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Books and References:

SN	Title	Authors	Publisher	Edition	Year
1	Entrepreneurship and Small Business Management	P. M. Charantimath	Pearson Education, New Delhi	-	-
2	Entrepreneurship Development	CPSC, Manila	Tata McGraw-Hill	-	-
3	Entrepreneurship Development Small Business Enterprises	P. M. Charantimath	Pearson Education, New Delhi	-	-
4	Entrepreneurship - Successfully Launching New Ventures	Bruce R. Barringer R. Daunce Ireland	Pearson Education, New Delhi	-	-
5	Entrepreneurship	Hisrich R D, Peters M P	Tata McGraw-Hill	-	-
6	Entrepreneurship	Rajeev Roy	Oxford University Press	-	-
7	Entrepreneurial Development	Khanka. S.S	S.Chand & Co. Ltd., Ram Nagar, New Delhi	-	-



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B.E. Course					T.E. Open Elective (SEM : VI)				
Course Name : Cyber Security and Laws					Course Code : OEC- 6014				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory		Practical/Oral /Presentation	Term Work	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	100
3	-	-	3	3	25	75	--	--	
IA: In-Semester Assessment - Paper Duration – 1.5 Hours ESE: End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Cryptography and Network Security									

Course Objective: The course intends to deliver the fundamental knowledge to understand concepts of cyber law, intellectual property, cybercrimes, trademarks, domain theft, tools used in cyber security and analyze security policies, protocols applied in Indian IT Act 2008, security standards compliances.

Course Outcomes: Upon completion of the course students will be able to:

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the concept of cybercrime and its effect on outside world	L1
2	Interpret and apply IT law in various legal issues , Analyse security challenges and issues	L1, L2, L3, L4
3	Understand and analyse various attack using tools like wire shark , key logger etc.	L1
4	Distinguish different aspects of cyber law	L1, L2, L3, L4
5	Study India IT Act and analyse different case studies	L1, L2, L3, L4
6	Apply Information Security Standards compliance during software design and development	L1, L2, L3, L4



Detailed Syllabus:

Module No	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction to Cybercrime	07	L1
	Introduction to Cybercrime: Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime, Cybercrime and the Indian ITA 2000, A global Perspective on cybercrimes		
2	Symmetric and Asymmetric Cryptography	09	L1, L2, L3, L4
	Introduction to symmetric cryptography, Substitution cipher, transposition cipher, stream and block cipher, and arithmetic modes for block ciphers, Introduction to asymmetric cryptography Primes, factorization, Fermat's little theorem, Euler's theorem, and extended Euclidean algorithm, RSA, attacks on RSA, Diffie Hellman key exchange, Message integrity, message authentication, MAC, hash function, H MAC		
3	Cyber offenses & Cybercrime	10	L1
	Cyber offenses & Cybercrime: How criminal plan the attacks, Social Engg, Cyber stalking, Cyber café and Cybercrimes, Bot nets, Attack vector, Cloud computing, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Devices-Related Security Issues, Organizational Security Policies and Measures in Mobile Computing Era, Laptops		
4	Tools and Methods Used in Cyber line	08	L1, L2, L3, L4
	Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Over Flow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft)		
5	The Concept of Cyberspace	09	L1, L2, L3, L4
	E-Commerce, The Contract Aspects in Cyber Law, The Security Aspect of Cyber Law, The Intellectual Property Aspect in Cyber Law, The Evidence Aspect in Cyber Law, The Criminal Aspect in Cyber Law, Global Trends in Cyber Law, Legal Framework for Electronic Data Interchange Law Relating to Electronic Banking, The Need for an Indian Cyber Law		
6	Indian IT Act.	07	L1, L2, L3, L4
	Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000, IT Act. 2008 and its Amendments		
Total Hours		45	



Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Cyber Security	Nina Godbole, Sunit Belapure	Wiley India ,New Delhi	2 nd	2011
2	The Indian Cyber Law	Suresh T. Vishwanathan	Bharat Law House,New Delhi	2 nd	2015
3	Cyber Law & Cyber Crimes	Advocate Prashant Mali	Snow White Publications, Mumbai	2 nd	2015
4	Information Systems Security	Nina Godbole	Wiley India, New Delhi	2 nd	2014
5	Cyber Security & Global Information Assurance	Kennetch J. Knapp	Information Science Publishing.	1 st	2009



T. E. Sem –VI

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)

TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. Course						T.E. Open Elective SEM:VI				
Course Name: Reliability Engineering						Course Code: OEC- 6015				
Teaching Scheme (Program Specific)						Examination scheme				
Modes of Teaching / Learning / Weightage						Modes of Continuous Assessment / Evaluation				
Hours Per Week- Theory (100)						Practical/Oral (25)		Term Work (25)		Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR		TW	100
03	-	-	3	3	25	75	-	-	-	
<p>IA : Internal Assessment - Paper Duration – 1.5 Hours ESE : - End Semester Examination Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance (20%)</p>										
Prerequisite: Signals and Systems, Control systems										

Course Objective: To impart various aspects of probability theory, system reliability, and maintainability, availability and FMEA procedure.

Course Outcomes: Students will be able to:

SN	Course Outcomes	Cognitive Levels as per Bloom's Taxonomy
1	Understand and apply the concept of Probability to engineering problems	L1,L2,L3
2	Apply various reliability concepts to calculate different reliability parameters	L1,L2,L3,L4
3	Estimate the system reliability of simple and complex systems	L1,L2,L3
4	Carry out a Failure Mode Effect and Criticality Analysis	L1,L2,L3,L4

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive Levels as per Bloom's Taxonomy
1	<p>Probability theory Probability: Standard definitions and concepts; Conditional Probability, Baye's Theorem. Probability Distributions: Central tendency and Dispersion; Binomial, Normal, Poisson, Weibull, Exponential, relations between them and their significance. Measures of Dispersion: Mean, Median, Mode, Range, Mean Deviation, Standard Deviation, Variance, Skewness and Kurtosis.</p>	9	L1,L2,L3
2	<p>Reliability Concepts Reliability Concepts: Reliability definitions, Importance of Reliability, Quality Assurance and Reliability, Bath Tub Curve.</p>	09	L1,L2,L3,L4



	Failure Data Analysis: Hazard rate, failure density, Failure Rate, Mean Time To Failure (MTTF), MTBF, Reliability Functions. Reliability Hazard Models: Constant Failure Rate, Linearly increasing, Time Dependent Failure Rate, Weibull Model. Distribution functions and reliability analysis.		
3	System Reliability: System Reliability: System Configurations: Series, parallel, mixed configuration, k out of n structure, Complex systems	07	L1,L2,L3
4	Reliability Improvement: Reliability Improvement: Redundancy Techniques: Element redundancy, Unit redundancy, Standby redundancies. Markov analysis. System Reliability Analysis – Enumeration method, Cut-set method, Success, Path method, Decomposition method.	08	L1,L2
5	Maintainability and Availability Maintainability and Availability: System downtime, Design for Maintainability: Maintenance requirements, Design methods: Fault Isolation and self-diagnostics, Parts standardization and Interchangeability, Modularization and Accessibility, Repair Vs Replacement. Availability – qualitative aspects.	6	L1,L2,L3,L4
6	Failure Mode, Effects and Criticality Analysis Failure mode effects analysis: severity/criticality analysis, FMECA examples. Fault tree construction, basic symbols, development of functional reliability block diagram, Fault tree analysis and Event tree Analysis	6	L1,L2,L3,L4
	Total Hours:	45	

Books and References:

S. No	Title	Authors	Publisher	Edition	Year
1	Reliability Engineering”,	L.S. Srinath,	“Affiliated East-Wast Press (P) Ltd	3 rd Edition	1985
2	“Reliability and Maintainability Engineering	Charles E. Ebeling	Tata McGraw Hill.	4 th Edition	2015
3	Engineering Reliability	B. S. Dhillion C. Singh,	John Wiley & Sons	5 th edition	1980
4	Practical Reliability Engg.”,	P.D.T. Conor	John Wiley & Sons	3 rd Edition	1985.
5.	Reliability in Engineering Design	K.C. Kapur, L.R. Lamber son	John Wiley & Sons.	3 rd Edition	1989
6.	Probability and Statistics	Murray R. Spiegel	Tata McGraw-Hill Publishing Co. Ltd.	5 th edition	1980



T.E. SEM VI

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)**

B.E. Course					T.E. Open Elective SEM: VI				
Course Name: Product Life Cycle Management					Course Code: OEC- 6016				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory(100)		Practical/Oral (20)	Term Work (20)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/ OR	TW	100
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment- Paper Duration-1 .5 Hours ESE : End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance (20%)									
Prerequisite: Product Design and Development, Quality and Reliability Engineering									

Course Objectives:

Course intend to provide an exposure to new product development program and guidelines for designing and developing a product and apply the knowledge of Product Data Management & PLM strategies.

Course Outcomes:

_SN	Course Outcomes	Cognitive levels as per bloom's Taxonomy
1	Illustrate knowledge about phases of PLM, PLM strategies and methodology for PLM feasibility study and PDM implementation	L1, L2
2	Illustrate various approaches and techniques for designing and developing products.	L1
3	Apply product engineering guidelines / thumb rules in designing products for moulding, machining, sheet metal working etc	L1, L2, L3, L4
4	Acquire knowledge in applying virtual product development tools for components, machining and manufacturing plant	L1, L2, L3, L4
5	Apply Integration of Environmental Aspects in Product Design	L1, L2, L3, L4
6.	Illustrate knowledge about Life Cycle Assessment and Life Cycle Cost Analysis	L1, L2



Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per bloom's Taxonomy
1	<p>Introduction to Product Lifecycle Management (PLM) and PLM Strategies</p> <p>Product Lifecycle Management (PLM), Need for PLM, Product Lifecycle Phases, Opportunities of Globalization, Pre-PLM Environment, PLM Paradigm, Importance & Benefits of PLM, Widespread Impact of PLM, Focus and Application, A PLM Project, Starting the PLM Initiative, PLM Applications</p> <p>Industrial strategies, Strategy elements, its identification, selection and implementation, Developing PLM Vision and PLM Strategy, Change management for PLM</p>	11	L1, L2
2	<p>Product Design</p> <p>Product Design: Product Design and Development Process, Engineering Design, Organization and Decomposition in Product Design, Typologies of Design Process Models, Reference Model, Product Design in the Context of the Product Development Process, Relation with the Development Process Planning Phase, Relation with the Post design Planning Phase, Methodological Evolution in Product Design, Concurrent Engineering, Characteristic Features of Concurrent Engineering, Concurrent Engineering and Life Cycle Approach, New Product Development (NPD) and Strategies, Product Configuration and Variant Management, The Design for X System, Objective Properties and Design for X Tools, Choice of Design for X Tools and Their Use in the Design Process</p>	10	L1
3	<p>Product Data Management (PDM)</p> <p>Product Data Management (PDM): Product and Product Data, PDM systems and importance, Components of PDM, Reason for implementing a PDM system, financial justification of PDM, barriers to PDM implementation</p>	6	L1, L2, L3, L4
4	<p>Virtual Product Development Tools</p> <p>Virtual Product Development Tools: For components, machines, and manufacturing plants, 3D CAD systems and realistic rendering techniques, Digital mock-up, Model building, Model analysis, Modeling and simulations in Product Design, Examples/Case studies</p>	6	L1, L2, L3, L4
5	<p>Integration of Environmental Aspects in Product Design</p> <p>Integration of Environmental Aspects in Product Design: Sustainable Development, Design for Environment, Need for Life Cycle Environmental Strategies, Useful Life Extension Strategies, End-of-Life Strategies, Introduction of Environmental Strategies into the Design Process, Life Cycle</p>	6	L1, L2, L3, L4



	Environmental Strategies and Considerations for Product Design		
6	Life Cycle Assessment and Life Cycle Cost Analysis	6	L1, L2
	Life Cycle Assessment and Life Cycle Cost Analysis: Properties, and Framework of Life Cycle Assessment, Phases of LCA in ISO Standards, Fields of Application and Limitations of Life Cycle Assessment, Cost Analysis and the Life Cycle Approach, General Framework for LCCA, Evolution of Models for Product Life Cycle Cost Analysis. Introduction to Industry4.0, Design principles and Challenges, Applications of Industry 4.0		
	Total Hours:	45	

Books and References:

SN	Title	Authors	Publisher	Edition	Year
1	Product Lifecycle Management: Paradigm for 21st Century Product Realisation	John Stark	Springer-Verlag	1 st Edition	2004



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**Open Elective-II for B.E. Semester–VII
Choice Based Credit Grading Scheme with Holistic Student Development
(CBCGS- H 2019) TCET Autonomy Scheme (w.e.f. A.Y. 2021-22)**



B.E. Semester-VII

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)**

B.E. Course					B.E. Open Elective SEM : VII				
Course Name : Management Information System)					Course Code: OEC 7011				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theor y	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	100
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment- Paper Duration – 1.5 Hours ESE : End Semester Examination- Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Database Design and Management									

Course Objective: The course intends to deliver the role of Management in Information Systems to understand the impact of these systems within an Organization to improve business performance and decision making. It analyzes typical functional information systems, principal tools and technologies for accessing information from databases & interpreting Ethical issues & Privacy for the same.

Course Outcomes : Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Explain how information systems Transform Business	L1, L2
2	Understand about Data and Knowledge Management	L1, L2, L3
3	Analyze the Ethical issues and Privacy in Information Systems	L1, L2, L3, L4
4	Understand the principal tools and technologies for accessing information from databases to improve business performance and decision making	L1, L2, L3
5	Analyze the types of systems used for enterprise-wide knowledge management and how they provide value for businesses	L1, L2, L3, L4
6	Analyze the impact of information systems have on an organization	L1, L2, L3, L4



Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction To Information Systems (IS)	6	L1, L2
	Computer Based Information Systems, Impact of IT on organizations, Importance of IS to Society. Organizational Strategy, Competitive Advantages and IS		
2	Data and Knowledge Management	9	L1, L2, L3
	Database Approach, Big Data, Data warehouse and Data Marts, Knowledge Management Business intelligence (BI): Managers and Decision Making, BI for Data analysis and Presenting Results		
3	Ethical issues and Privacy	8	L1, L2, L3, L4
	Information Security. Threat to IS, and Security Controls		
4	Social Computing (SC)	7	L1, L2, L3
	Web 2.0 and 3.0, SC in business-shopping, Marketing, Operational and Analytic CRM, E-business and E-commerce – B2B B2C. Mobile commerce.		
5	Wired and Wireless Technology	7	L1, L2, L3, L4
	Computer Networks Wired and Wireless Technology, Pervasive computing, Cloud computing model.		
6	Information System within Organization	8	L1, L2, L3, L4
	Transaction Processing Systems, Functional Area Information System, ERP and ERP support of Business Process. Acquiring Information Systems and Applications: Various System development life cycle models		
	Total Hours	45	

Books and References:

Sr. No.	Title	Author s	Publisher	Edition	Year
1.	Management Information Systems	Kelly Rainer, Brad Prince	Wiley	Sixth Edition	2011
2.	Management Information Systems	K.C. Laudon and J.P. Laudon	Prentice Hall	Tenth Edition	2007
3.	Managing Information Systems: Strategy and Organization	D. Boddy, A. Boonstra	Prentice Hall	Tenth Edition	2008



Online References:

Sr. No	Website Name	URL	Modules Covered
1	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/management_information_system/	M1
2	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/management_information_system/information_need_objective.htm	M2
3	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/management_information_system/mis_security_and_ethical_issues.htm	M3
4	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/management_information_system/system_development_life_cycle.htm	M4
5	https://pressbooks.com/	https://bus206.pressbooks.com/chapter/chapter-13-future-trends-in-information-systems/	M5
6	https://www.tutorialspoint.com/index.htm	https://www.tutorialspoint.com/management_information_system/business_continuity_planning.htm	M6



B.E. Semester –VII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS-H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. Course					B.E. Open Elective (SEM : VII)						
Course Name: Human Resource Management					Course Code: OEC- 7012						
Teaching Scheme (Program Specific)					Examination Scheme Formative/Summative						
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation						
Hours Per Week					Theory (100)		Practical/Oral (25)		Term Work (25)		Total
Theory	Tutorial	Practical	Contact Hours	Credit	IA	ESE	PR		TW		
3	-	-	3	3	25	75	-	-	-	-	100
<p align="center">IA: In-Semester Assessment - Paper Duration – 1.5 Hours ESE: End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</p>											
Pre-requisite: The course does not have any pre-requisites.											

Course Objective:

The course intends to deliver basic concept, techniques and practices of the human resource Management. The course also gives opportunity of learning Human resource management (HRM) processes, related with the functions, and challenges in the emerging perspective of today's organizations, also helps student to acquaint the importance of inter-personal & inter-group behavioral skills in an organizational setting required for future stable engineers, leaders and managers.

Course Outcomes: Upon Completion of Course student will be able to:

SN	Course Outcomes	Cognitive levels of attainment
1	Understand the concepts, aspects, techniques and practices of the human resource management.	L1,L2
2	Understand the Human resource management (HRM) processes, functions, changes and challenges in today's emerging organizational perspective.	L1,L2
3	Gain knowledge about the latest developments and trends in HRM.	L1,L2,L3
4	Understand the Training and development process in HRM	L1,L2,L3
5	Applying Leadership and Decision Making qualities	L1,L2,L3,L4
6	Apply the knowledge of behavioral skills learnt and integrate it with in inter personal and Inter group environment emerging as future stable engineers and managers.	L1,L2,L3,L4



Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment
1	Human Resource Management development	06	L1,L2
	Human Resource Management- Concept, Scope and Importance, Interdisciplinary Approach Relationship with other Sciences, Competencies of HR Manager, HRM functions. Human resource development (HRD): changing role of HRM – Human resource Planning, Technological change, Restructuring and rightsizing, Empowerment, TQM, Managing ethical issues.		
2	Organizational Behaviour (OB)	07	L1,L2
	Introduction to OB Origin, Nature and Scope of Organizational Behaviour, Relevance to Organizational Effectiveness and Contemporary issues. Personality: Meaning and Determinants of Personality, Personality development, Personality Types, Assessment of Personality Traits for Increasing Self Awareness. Perception: Attitude and Value, Effect of perception on Individual Decision-making, Attitude and Behaviour. Motivation: Theories of Motivation and their Applications for Behavioural Change (Maslow, Herzberg, McGregor). Group Behaviour and Group Dynamics: Work groups formal and informal groups and stages of group development, Team Effectiveness: High performing teams, Team Roles, cross functional and self-directed team. Case study.		
3	Organizational Structure & Design	08	L1,L2,L3
	Structure, size, technology, Environment of organization; Organizational Roles & conflicts: Concept of roles; role dynamics; role conflicts and stress. Leadership: Concepts and skills of leadership, Leadership and managerial roles, Leadership styles and contemporary issues in leadership. Power and Politics: Sources and uses of power; Politics at workplace, Tactics and strategies.		



4	Human resource Planning	08	L1,L2,L3
	Recruitment and Selection process, Job-enrichment, Empowerment - Job-Satisfaction, employee morale. Performance Appraisal Systems: Traditional & modern methods, Performance Counseling, Career Planning. Training & Development: Identification of Training Needs, Training Methods.		
5	Emerging Trends in HR	07	L1,L2,L3,L4
	Organizational development; Business Process Re-engineering (BPR), BPR as a tool for organizational development, managing processes & transformation in HR. Organizational Change, Culture, Environment. Cross Cultural Leadership and Decision Making: Cross Cultural Communication and diversity at work, Causes of diversity, managing diversity with special reference to handicapped, women and ageing people, intra company cultural difference in employee motivation.		
6	HR&MS	09	L1,L2,L3,L4
	HR & MIS: Need, purpose, objective and role of information system in HR, Applications in HRD in various industries (e.g. manufacturing R&D, Public Transport, Hospitals, Hotels and service industries). Strategic HRM: Role of Strategic HRM in the modern business world, Concept of Strategy, Strategic Management Process, Approaches to Strategic Decision Making; Strategic Intent – Corporate Mission, Vision, Objectives and Goals. Labor Laws & Industrial Relations: Evolution of IR, IR issues in organizations, Overview of Labor Laws in India; Industrial Disputes Act, Trade Unions Act, Shops and Establishments Act.		
Total		45	

Books & References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Organizational Behavior	Stephen Robbins,	Excel publishing	16 th Ed	2013
2	Human Resource Management	V S P Rao,	Excel publishing	3 rd Ed	2010
3	Human resource management	Aswathapa,	Text & cases	6 th Ed,	2011
4	Dynamics of Industrial Relations in India	C. B. Mamoria and S V Gankar,	Himalaya Publishing,	15 th Ed	2015
5	Essentials of Human Resource management and Industrial relations	P. Subba Rao,	Himalaya Publishing,	5 th Ed	2013



6	Management & Organizational Behavior	Laurie Mullins	Himalaya Publishing,	Latest Ed	2016
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Online References:

S. No	Website Name	URL	Modules Covered
1	NPTEL	https://nptel.ac.in/courses/110105069/	M1,M2,M3
2	COURSE ERA	https://www.coursera.org/specializations/human-resource-management	M4,M5
3	SWAYAM	https://swayam.gov.in/nd1_noc19_mg51/preview	M1,M2,M5,M6



B.E. Semester –VII

**Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)**

B.E. Course					B.E. Open Elective (SEM : VII)				
Course Name: Design Thinking and Problem-Solving Skills					Course Code: OEC- 7013				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	100
3	-	-	3	3	25	75	-	-	
<p>IA: In-Semester Assessment- Paper Duration – 1.5 Hours ESE : End Semester Examination- Paper Duration - 3 Hours</p>									
Prerequisite: Not Required									

Course Objective: To inculcate interdisciplinary engineering skills in students for taking real time engineering problem available in our society/industry and to come-up with the grass root innovation, can be helpful to all level of human beings.

Course Outcomes: Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the importance of Design Thinking and Apply design thinking for product development	L1,L2
2	Evaluate the quality of your information and your emotions; keep thinking Straight and use design thinking tools	L1,L2,L3,L4
3	Identify skills and personality traits of successful problem solving.	L1,L2,L3,L4
4	Apply standard problem-solving heuristics to aid in problem solving.	L1,L2,L3,L4,L5,L6
5	Apply design thinking to improve on existing products in IT	L1,L2,L3,L4,L5,L6
6	Formulate and successfully communicate the solutions to problems.	L1,L2,L3,L4,L5,L6



Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	Design Thinking Introduction, Team Formation, Documentation and Canvas	7	L1,L2
	roduction, Need of Design Thinking, Traditional Problem Solving versus Design Thinking, phases of Design Thinking, Tools for Design Thinking, Relevance of Design and Design Thinking in Engineering, Team Formation, Documentation and Canvas Team Building Domain Selection (Society/Industry project), Log Books-need, types of log book, preparation of log book, Importance of Documentation, Strategy Design		
2	Design Thinking Exercise	8	L1,L2,L3,L4
	Formation of Team and aspects for the selection, Domain selection, Observation exercise, Design activities through Canvas, Brainstorming for the problem, Users Interview conduction, generation of records via logbooks		
3	Problem Solving Skills Introduction	8	L1,L2,L3,,L4
	Developing logical thinking. Introduction to Problem Solving in Computer Science domain, Errors in reasoning; verbal reasoning; analogy problems lateral thinking, Problem Solving Techniques Deductive and hypothetical reasoning; computational problem solving; generating, implementing, and evaluating solutions; interpersonal problem solving, Group Activities based assignments related to problem solving skills will be given for better understanding and development of problem solving skills		
4	Tools for Design Thinking	7	L1,L2,L3,L4,L5,L6
	Theory and practice in Design thinking – Exploring work of Designers across globe – MVP or Prototyping ,Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design		
5	Design Thinking in IT	7	L1,L2,L3,L4,L5,L6
	Design Thinking to Business Process modeling – Agile in Virtual collaboration environment – Scenario based Prototyping		
	Design Thinking For strategic innovations	8	L1,L2,L3,L4,L5,L6



6	DT For strategic innovations – Growth – Story telling - Predictability – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.		
Total Hours		45	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Strategies for Creative Problem Solving	H. S. Fogler and S. E. LeBlanc	Pearson,	Second	2008
2	Problem Solving & Comprehension	A. Whimbey and J. Lochhead	Lawrence Erlbaum, Mahwah,	Sixth	1999
3	The Design of Business: Why Design Thinking is the Next Competitive Advantage	Roger Martin	Harvard Business Press	First	2009
4	Design Thinking: Understand – Improve – Apply	Hasso Plattner, Christoph Meinel and Larry Leifer	Springer, 2011 (Unit III)	First	2011
5	Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School. (Unit IV).	Idris Mootee	John Wiley & Sons 2013	First	2013
6	Effective Problem Solving	M. Levine	Prentice Hall	Second	1994

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	https://www.coursera.org	https://www.coursera.org/learn/uva-darden-design-thinkinginnovation	M1,M2,M3,
2	http://www.cs.odu.edu	http://www.cs.odu.edu/~cs381/cs381content/problem_solving/problem_solving.html	M4,M5,M6
3	https://www.cs.vt.edu	https://www.cs.vt.edu/undergraduate/courses/CS2104	M1,M2,M3,M4,M5,M6
4	https://ryanstutorials.net	https://ryanstutorials.net/problem-solving-skills/	M3,M4
5	https://dschool.stanford	https://dschool.stanford.edu/.../designresources/.../	M1,M2,M3,M5



	d.edu	ModeGuideBOOTCAMP2010L.pdf	
6	https://dschool.stanford.edu	https://dschool.stanford.edu/use-our-methods/	M4,M5,M6
7	https://www.interaction-design.org	https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process	M1,M2,M5,M6
8	http://www.creativityatwork.com	http://www.creativityatwork.com/design-thinking-strategy-for-innovation/49	M1,M2,M5,M6
9	https://www.nngroup.com	https://www.nngroup.com/articles/design-thinking/	M1,M2,M3,M4,M6
10	www.designthinkingformobility.org	www.designthinkingformobility.org/wp-content/.../10/NapkinPitch_Worksheet.pdf	M4,M5,M6



B.E. SEMESTER -VII

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)

TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. Course					B.E. Open Elective (SEM: VII)				
Course Name: Disaster Management and Mitigation Measures					Course Code: OEC- 7014				
Contact Hours Per Week: 03					Credit: 03				
Teaching Scheme (Program Specific)					Examination Scheme Formative/Summative				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	Tutorial	100
3	-	-	3	3	25	75	-	-	
<p>IA: Mid Semester Examination- Paper Duration – 1.5 Hours ESE : Semester End Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</p>									
Prerequisite: Environmental Studies									

Course Objectives:

Main objective of the subject is to understand causes of different types of disasters, mitigation /rehabilitation measures and existing government policies and agencies.

Course Outcomes:

SN	Course Outcomes	Cognitive levels as per bloom's taxonomy
1	Get to know natural as well as manmade disaster and their extent and possible effects on the economy.	L1, L2,L3
2	Plan of national importance structures based upon the previous history.	L1, L2,L3
3	Get acquainted with government policies, acts and various organizational structure associated	L1, L2,L3
4	Get to know the simple do's and don'ts in such extreme events and act accordingly.	L1, L2,L3



Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per bloom's taxonomy
1	Introduction		
	Definition of Disaster, hazard, global and Indian scenario, general perspective, importance of study in human life, Direct and indirect effects of disasters, long term effects of disasters. Introduction to global warming and climate change	04	L1, L2,L3
2	Natural Disaster and Manmade disasters		
	Natural Disaster: Meaning and nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge, climate change, global warming, sea level rise, ozone depletion, Manmade Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing population and subsequent industrialization, urbanization and changing lifestyle of human beings in frequent occurrences of manmade disasters	09	L1, L2,L3
3	Disaster Management, Policy and Administration		
	Disaster management: meaning, concept, importance, objective of disaster management policy, disaster risks in India, Paradigm shift in disaster management Policy and administration: Importance and principles of disaster management policies, command and co-ordination of in disaster management, rescue operations-how to start with and how to proceed in due course of time, study of flowchart showing the entire process.	09	L1, L2,L3
4	Institutional Framework for Disaster Management in India		
	Importance of public awareness, Preparation and execution of emergency management program. Scope and responsibilities of National Institute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India. Methods and measures to avoid disasters, Management of casualties, set up of emergency facilities, importance of effective communication amongst different agencies in such situations. Use of Internet and softwares for effective disaster management. Applications of GIS, Remote sensing and GPS in this regard.	07	L1, L2,L3
5	Financing Relief Measures		
	Ways to raise finance for relief expenditure, role of government agencies and NGO's in this process, Legal aspects related to finance raising as well as overall management of disasters. Various NGO's and the works they have carried out in the past on the occurrence of various disasters, Ways to approach these teams. International relief aid agencies and their role in extreme events	10	L1, L2,L3
6	Preventive and Mitigation Measures		



	Pre-disaster, during disaster and post-disaster measures in some events in general. Structural mapping: Risk mapping, assessment and analysis, sea walls and embankments, Bio shield, shelters, early warning and communication. Non Structural Mitigation: Community based disaster preparedness, risk transfer and risk financing, capacity development and training, awareness and education, contingency plans. Do's and don'ts in case of disasters and effective implementation of relief aids.	06	L1, L2,L3
Total		45	

Books & References:

SN	Title	Authors	Publisher	Edition	Year
1	Disaster Management	Harsh K.Gupta	Universities Press Publications	1 st	2003
2	Disaster Management: An Appraisal of Institutional Mechanisms in India	O.S.Dagur	Centre for land warfare studies	1 st	2011
3	Introduction to International Disaster Management	Damon Copolla	Butterworth Heinemann Elsevier Publications	1 st	2006
4	Disaster Management Handbook	Jack Pinkowski	CRC Press Taylor and Francis group	1 st	2008
5	Disaster management & rehabilitation	Rajdeep Dasgupta	Mittal Publications	1 st	2007
6	Natural Hazards and Disaster Management, Vulnerability and Mitigation	R B Singh	Rawat Publications	1 st	2006
7	Concepts and Techniques of GIS	C.P. Lo Albert, K.W. Yonng	Prentice Hall (India) Publications.	1 st	2006



B.E. Semester –VII

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)

TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B. E. Course					B.E. Open Elective SEM: VII				
Course Name: Research Methodology					Course Code: OEC- 7015				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/ Oral (25)	Term Work (50)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	100
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment - Paper Duration –1.5 Hours ESE: End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance (20%)									
Prerequisite: Basics of Statistics									

Course Objective: The objective of this course is to make students understand research problem formulation and analyze research related information.

Course Outcomes: Upon completion of the course students will be able to:

S. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand research problem formulation.	L1, L2, L3
2	Analyze research related information	L1, L2, L3, L4
3	Follow research ethics	L1, L2, L3
4	Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.	L1, L2, L3
5	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.	L1, L2, L3
6	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.	L1, L2, L3



ज्ञानं शिवाय न विद्यते (Sanskrit)

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Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per bloom's Taxonomy
1	Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process	5	L1, L2, L3
2	Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis – Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance	6	L1, L2, L3, L4
3	Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables	9	L1, L2, L3
4	Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.	7	L1, L2, L3
5	Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish? Ethical issues related to publishing, Plagiarism and Self-Plagiarism.	9	L1, L2, L3
6	Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism	8	L1, L2, L3
	Totals	45	

Books and References:

S. No.	Title	Authors	Publisher	Edition	Year
1	Research methodology: an introduction for science & engineering students	Stuart Melville and Wayne Goddard	Juta Academic	1 st edition	1996
2	Research Methodology: An Introduction	Wayne Goddard and Stuart Melville	Juta and Company Ltd	2 nd edition	2004
3	Research Methodology: A Step by Step Guide for beginners	Ranjit Kumar	SAGE Publications Ltd	3 rd edition	2014

Online References:

S. No.	Website Name	URL	Modules Covered
1	www.nptel.ac.in	https://nptel.ac.in/courses/121/106/121106007/	M1, M2, M3, M4, M5, M6
2	www.coursera.org	https://www.coursera.org/browse/physical-science-and-engineering/research-methods	M1, M2, M3, M4, M5, M6
3	www.udemy.com	https://www.udemy.com/course/research-methods/	M1, M2, M3, M4, M5, M6



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BE SEMESTER VII

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)

TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. Course					B.E. Open Elective SEM: VII				
Course Name: Operation Research					Course Code: OEC- 7016				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (20)	Term Work (20)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/ OR	TW	100
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment- Paper Duration-1.5 Hours ESE : End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance (20%)									
Prerequisite: Engineering Mathematics									

Course Objectives: Course intend to deliver the optimization techniques so that student should be able to optimize any engineering product or process.

Course Outcome:

SN	Course Outcomes	Cognitive levels as per bloom's Taxonomy
1	Understand the theoretical workings of the simplex method, the relationship between a linear program and its dual, including strong duality and complementary slackness.	L1, L2, L3, L4
2	Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change	L1, L2, L3, L4
3	Solve specialized linear programming problems like the transportation and assignment problems, solve network models like the shortest path, minimum spanning tree, and maximum flow problems	L1, L2, L3, L4
4	Understand the applications of integer programming and a queuing model and compute important performance measures	L1, L2, L3, L4
5	To apply conflict between two players	L1, L2, L3, L4
6	To apply EOQ model in inventory	L1, L2, L3, L4



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Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per bloom's Taxonomy
	Introduction to Operations Research		
1	Introduction, , Structure of the Mathematical Model, Limitations of Operations Research Linear Programming: Introduction, Linear Programming Problem, Requirements of LPP, Mathematical Formulation of LPP, Graphical method, Simplex Method Penalty Cost Method or Big M- method, Two Phase Method, Revised simplex method, Duality , Primal – Dual construction, Symmetric and Asymmetric Dual, Weak Duality Theorem, Complimentary Slackness Theorem, Main Duality Theorem, Dual Simplex Method, Sensitivity Analysis Transportation Problem: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method Assignment Problem Introduction, Mathematical Formulation of the Problem, Hungarian Method Algorithm, Processing of n Jobs Through Two Machines and m Machines, Graphical Method of Two Jobs m Machines Problem Routing Problem, Travelling Salesman Problem Integer Programming Problem Introduction, Types of Integer Programming Problems, Gomory's cutting plane Algorithm, Branch and Bound Technique. Introduction to Decomposition algorithms.	11	L1, L2, L3, L4
2	Queuing models: queuing systems and structures, single server and multi-server models, Poisson input, exponential service, constant rate service, finite and infinite population	05	L1, L2, L3, L4
3	Simulation: Introduction, Methodology of Simulation, Basic Concepts, Simulation Procedure, Application of Simulation Monte-Carlo Method: Introduction, Monte-Carlo Simulation, Applications of Simulation, Advantages of Simulation, Limitations of Simulation	05	L1, L2, L3, L4
4	Dynamic programming. Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stage Coach/Shortest Path, cargo loading and Reliability problems.	6	L1, L2, L3, L4
	Game Theory.		



5	Competitive games, rectangular game, saddle point, minimax (maximin) method of optimal strategies, value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.	10	L1, L2, L3, L4
6	Inventory Models	08	L1, L2, L3, L4
	Classical EOQ Models, EOQ Model with Price Breaks, EOQ with Shortage, Probabilistic EOQ Model,		
Total hours:		45	

Books and References:

SN	Title	Authors	Publisher	Edition	Year
1	Operations Research - An Introduction	Taha, H.A.	Prentice Hall,	7th Edition,	2002-
2	Operations Research: Principles and Practice	Ravindran, A, Phillips	John Willey and Sons	2nd Edition -	2009
3	Introduction to Operations Research	Hiller, F. S. and Liebermann	McGraw Hill	1 st Edition	-
4	Operations Research	S. D. Sharma	KedarNath Ram Nath- Meerut	1 st Edition	-



Laxda Singh Charitable Trust's (A.Kytd.)

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Open Elective-III for B.E. Semester–VIII
Choice Based Credit Grading Scheme with Holistic Student Development
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B.E. Semester –VIII

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)

TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. Course					B.E. Open Elective SEM : VIII				
Course Name: Project Management					Course Code : OEC- 8011				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	
3	-	-	3	3	25	75	-	-	100
IA: In-Semester Assessment - Paper Duration – 1.5 Hours									
ESE: End Semester Examination - Paper Duration - 3 Hours									
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Data Structure, Software Engineering									

Course Objective: The objective of the course is to familiarize the students with the use of a structured methodology/approach for each and every unique project undertaken, including utilizing project management concepts, tools and techniques and appraise the students with the project management life cycle and make them knowledgeable about the various phases from project initiation through closure.

Course Outcomes: Upon completion of the course students will be able to:

Sr No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Apply selection criteria and select an appropriate project from different options	L1, L2, L3, L4
2	Write work break down structure for a project and develop a schedule based on it	L1, L2, L3, L4
3	Identify opportunities and threats to the project and decide an approach to deal with them strategically.	L1, L2, L3, L4
4	Use Earned value technique and determine & predict status of the project.	L1, L2, L3, L4
5	Compare and contrast various project execution, Monitoring and Controlling Projects, Project Contracting, Project Leadership and Ethics and Closing the Project	L1, L2, L3, L4
6	Capture lessons learned during project phases and document them for future reference	L1, L2



Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	Project Management Foundation	6	L1, L2, L3, L4
	Definition of a project, Project Vs Operations, Necessity of project management, Triple constraints, Project life cycles (typical & atypical) Project phases and stage gate process. Role of project manager, Negotiations and resolving conflicts, Project management in various organization structures, PM knowledge areas as per Project Management Institute (PMI).		
2	Initiating Projects	6	L1, L2, L3, L4
	How to get a project started, Selecting project strategically, Project selection models (Numeric /Scoring Models and Non-numeric models), Project portfolio process, Project sponsor and creating charter; Project proposal. Effective project team, Stages of team development & growth (forming, storming, norming & performing), team dynamics		
3	Project Planning and Scheduling	8	L1, L2, L3, L4
	Work Breakdown structure (WBS) and linear responsibility chart, Interface Co-ordination and concurrent engineering, Project cost estimation and budgeting, Top down and bottoms up budgeting, Networking and Scheduling techniques. PERT, CPM, GANTT chart, Introduction to Project Management Information System (PMIS).		
4	Planning Projects	8	L1, L2, L3, L4
	Crashing project time, Resource loading and levelling, Goldratt's critical chain, Project Stakeholders and Communication plan Risk Management in projects: Risk management planning, Risk identification and risk register, Qualitative and quantitative risk assessment, Probability and impact matrix. Risk response strategies for positive and negative risks		
5	Executing Projects, Monitoring and Controlling Projects & Project Contracting	10	L1, L2, L3, L4
	5.1 Executing Projects: Planning monitoring and controlling cycle, Information needs and reporting, engaging with all stakeholders of the projects, Team management, communication and project meetings		
	5.2 Monitoring and Controlling Projects: Earned Value Management techniques for measuring value of work completed; Using milestones for measurement; change requests and scope creep, Project audit. 5.3 Project Contracting : Project procurement management, contracting and outsourcing,		
6	Project Leadership and Ethics & Closing the Project	7	L1, L2
	6.1 Project Leadership and Ethics: Introduction to project leadership, ethics in projects, Multicultural and virtual projects 6.2 Closing the Project: Customer acceptance; Reasons of project termination, Various types of project terminations (Extinction, Addition, Integration, Starvation), Process of project termination, completing a final report; doing a lessons learned analysis; acknowledging successes and failures; Project management templates and other resources; Managing without authority; Areas of further study.		
	Total Hours	45	



Swadha Singh Charitable Trust's (eKalyan)

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Books and References:

S.No	Title	Authors	Publisher	Edition	Year
1	Project Management Foundation:	Project Management: A managerial approach, Jack Meredith & Samuel Mantel.	Wiley India	Seventh Edition	2009
2	Initiating Projects & Project Planning and Scheduling	A Guide to the Project Management Body of Knowledge (PMBOK® Guide)	Project Management Institute PA, USA	Fifth Edition	--
3	Planning Projects	Project Management, Gido Clements	Cengage Learning	First Edition	--
4	Executing Projects, Monitoring and Controlling Projects & Project Contracting	Project Management, Gopalan Wiley India	Wiley India	First Edition	--
5	Project Leadership and Ethics & Closing the Project	Project Management, Dennis Lock.	Gower Publishing England	Ninth Edition	--

Online Resources:

S. No.	Website Name	URL	Modules Covered
1	http://www.opentextbooks.org.hk	http://www.opentextbooks.org.hk/system/files/export/15/15694/pdf/Project_Management_15694.pdf	M1-M6
2	https://www.nesacenter.org	https://www.nesacenter.org/uploaded/conferences/SEC/2014/handouts/Rick_Detwiler/15_Detwiler_Resources.pdf	M1-M3, M6
3	http://www.edo.ca	http://www.edo.ca/downloads/project-management.pdf	M1,M4



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B.E. Semester –VIII
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TCET Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. Course					BE Open Elective (SEM: VIII)				
Course Name: Energy Audit and Management					Course Code: OEC- 8012				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	100
3	-	-	3	3	25	75	-	-	
<p>IA: In-Semester Assessment - Paper Duration – 1.5 Hours ESE: End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</p>									
Prerequisite: - Knowledge of Basic Electrical and Mechanical Systems									

Course objectives:

1. To understand the importance energy security for sustainable development and the fundamentals of energy conservation.
2. To introduce performance evaluation criteria of various electrical and thermal installations to facilitate the energy management
3. To relate the data collected during performance evaluation of systems for identification of energy saving opportunities.

Course outcomes: After successful completion of the course student will be able:-

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	To identify and describe present state of energy security and its importance.	L1
2	To identify and describe the basic principles and methodologies adopted in energy audit of any utility.	L1, L2, L3
3	To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities.	L1, L2, L3, L4
4	To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities	L1, L2, L3, L4
5	To analyze the data collected during performance evaluation and recommend energy saving measures	L1, L2, L3
6	To understand the concept of Energy conservation measures in building complex	L1



Detailed Syllabus

Module No.	Unit No.	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1		Energy Scenario & Energy Conservation measures	06	L1
	1.1	Present Energy Scenario		
	1.2	Renewable and Non-Renewable form of Energy		
	1.3	Greenhouse Gas effect, Acid Rain, Energy Pricing, Energy Sector Reforms,		
	1.4	Energy Conservation and its Importance: Energy Conservation Act-2001 and its features. Role of Bureau of Energy Efficiency (BEE), Energy Security, Basic idea of Material and Energy balance		
2		Energy Audit & Energy Economics	08	L1, L2, L3
	2.1	Energy Audit: Definition, need, types of energy audit, Steps of detailed Energy Audit, Role of Energy Manager and Internal audit Team,		
	2.2	Measuring instruments & Equipment used during Energy audit		
	2.3	Understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement,		
	2.4	Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution		
	2.5	Elements of monitoring & targeting, Data and information analysis.		
	2.6	Energy Economics: Simple payback period (SPP), Net Present value (NPV), Return on investment (ROI), Internal rate of return (IRR)		
3		Energy Management in Electrical System	10	L1, L2, L3, L4
	3.1	Electricity billing, Basic concept of Electrical load management, Maximum demand Control, Energy management through Power factor improvement		
	3.2	Energy efficient equipment and appliances, Star ratings of Electrical Equipment.		
	3.3	<u>Lighting System control</u> : Occupancy sensors, daylight integration, and use of intelligent controllers. Energy efficiency measures in lighting system		
	3.4	<u>Energy conservation opportunities</u> in water pumps, industrial drives, induction motors, soft starters, variable speed drives.		
4		Energy Management in Thermal Systems	10	L1, L2, L3, L4
	4.1	Review of different thermal loads, <u>Steam System</u> : Basic idea of Steam distribution system, Assessment of steam distribution losses, Steam leakages, Steam trapping, Condensate and flash steam recovery system, Energy conservation in Steam distribution system,		
	4.2	<u>Boiler System</u> : General fuel conservation measures in Boilers and furnaces, Waste heat recovery, cogeneration, use of insulation- types and application.		
	4.3	<u>HVAC system</u> : Coefficient of performance, Capacity, factors affecting performance of Refrigeration and Air Conditioning		



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		system performance, Energy savings opportunities in HVAC system.		
5		Energy Performance Assessment	06	L1, L2, L3,
	5.1	Performance assessment of Motors, variable speed drive, pumps,		
	5.2	Lighting System calculations: Installed Load Efficacy Ratio (ILER) method,		
	5.3	HVAC system calculations; various terms used in assessment of performance		
6		Energy conservation in Residential and Commercial Buildings	05	L1
	6.1	Energy Conservation Building Codes (ECBC)		
	6.2	Green Building norms, LEED ratings of buildings, Use of renewable energy sources in building complex		
		Total	45	

Books and References:

SN	Title	Authors	Publisher
1.	Handbook of Electrical Installation Practice	Geofry Stokes	Blackwell Science
2.	Designing with light: Lighting System Handbook	By Anil Valia	-
3.	Energy Management handbook	W.C. Turner	John Wiley and Sons
4.	Handbook on Energy Audits and Management	A. K. Tyagi,	Tata Energy Research Institute (TERI).
5.	Energy Management Principles	C.B. Smith	Pergamon Press
6.	Energy Conservation Guidebook	Dale R. Patrick, S. Fardo, Ray E. Richardson	Fairmont Press
7.	Handbook of Energy Audits	Albert Thumann, W. J. Younger, T. Niehus	CRC Press

Online References:

SNo.	Website Name	URL	Modules Covered
1	Bureau of Energy Efficiency	https://beeindia.gov.in/content/energy-auditors	1-2
2	You tube	https://youtube/7hDyLuFJ0c8	1-6
3	You tube	https://www.youtube.com/watch?v=UhGZRoulr8U	1-6
4	NPTEL by IIT Roorkee	https://www.youtube.com/watch?v=2zWt-pBCU2I	1-3



Shri. S. S. Charitable Trust's (Regd.)

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B.E. Semester –VIII
Choice Based Credit Grading Scheme with Holistic Multidisciplinary Education -(CBCGS-H 2020) TCET
Autonomy Scheme (w.e.f. A.Y. 2020-21)

BE Information Technology					B.E. Open Elective SEM VIII				
Course Name : Innovation Management					Course Code : OEC IT- 8013				
Contact Hours Per Week : 3					Credits : 3				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral / (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	Total
3	-	-	3	3	25	75	-	-	100
IA: Mid Semester Assessment- Paper Duration – 1.5 hr ESE: End Semester Evaluation-Paper Duration-3 hrs.									
Prerequisite: Financial Accounting and Management and Business Modelling.									

Course Objective: The course intends to apply the concept of Innovation in Business.

Course Outcomes: Upon completion of the course students will be able to

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Able to analyze and apply impact of innovation on society	L1,L2,L4
2	Able to understand the role of technology in creating wealth	L1,L2,L3
3	Recognize markers of business models which appear as a response to digital revolution	L1,L2,L3,L4
4	Search for real cases which represent new business models	L1,L2,L3,L4
5	Identify similar and distinguished features of business build on identical business models	L1,L2,L3,L4
6	Know the most important cases of data-driven business founded on new business models	L2,L4



Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
01	Sources of Innovation	08	L1,L2,L4
	Sources of Innovation: Innovation / wealth creation process, three critical trajectories impacting the innovation process creative transformations, the importance of technological Innovation, The impact of technological innovation on society. Case study on impact of technological innovation on society. Industry dynamics of technological innovation, transcending creativity into innovation, innovation as a collaborative effort.		
02	Types and patterns of innovation	06	L1,L2,L3
	Types and patterns of innovation: Technology S curves, formulation of technological innovation strategy, implementing technological innovation strategies. Managing new product development. Case study on new product development.		
03	Collaboration strategies and Choosing innovative projects	08	L1,L2,L3,L4
	Collaboration Strategies: The role of technology in the creation of wealth, historical perspective, long-wave cycle, evolution of production technology, technology and national economy. Case study on Collaboration Strategies. Choosing innovative projects: Management of technology, the conceptual framework, technology and society, knowledge and technology, technology and business. Case study on How to choose innovative projects.		
04	Introduction to Business Models	8	L1,L2,L3,L4
	What is a Business Model? Importance of Business Model. History of Business Model. Type of Business Model		
05	Business models as a key concept of strategic management.	8	L1,L2,L3,L4
	Variety of business model frameworks: Canvas, 'Zott-Amit' model, BM navigator, 4W approach, Hybrid business models. Resource-based view (RBV). Industrial organization.		
06	Digital business models.	7	L2,,L4,
	E-commerce. Innovative business model in retail and consumer goods. Omnichannel retail. Manufacturing business models. Digital manufacturing. Developers as new decision makers. Case-study of Apple, Android, Tinkoff.		
	Total	45	

Books and References:



ज्ञानदा-सिंह-चरितबल-ट्रस्ट-का-अधीन (अ.के.ए.सि.)

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Sr. No	Title of the book	Authors	Publisher	Edition	Year
1	Strategic management of technological Innovation	Melissa A. Schilling	McGraw-Hill	Fifth Edition	2017
2	Management of technology	Tarek M. Khalil	McGraw Hill	Second Edition	2009
3	Business model generation: a handbook for visionaries, game changers, and challengers.	Osterwalder, A., & Pigneur, Y.	John Wiley & Sons	Third Edition	2010
4	Value creation in e-business.	Amit, R., & Zott, C.	Strategic management journal,	22(6-7), 493-520.	2001

Online Reference

SNo.	Website Name	URL	Modules Covered
1.	Ideaconnection.com	https://www.ideaconnection.com/innovation-videos/	M1,M2
2.	Ideaconnection.com	https://www.ideaconnection.com/innovation-videos/	M3,M4
3.	Ideaconnection.com	https://www.ideaconnection.com/innovation-videos/	M5,M6
4.	https://nptel.ac.in	https://nptel.ac.in/courses/110/107/110107094/	M1,M2,M3,M4,M5,M6
5.	Coursera.org	https://www.coursera.org/learn/digital-business-models/lecture/nJTB0/lesson-4-asymmetric-business-models-creating-unfair-advantage	M4,M5,M6
6.	online.stanford.edu	https://online.stanford.edu/courses/xine249-building-business-models	M1,M2,M3,M4,M5,M6



ज्ञानं शिवाय न चरितव्यम् (अक्षयम्)

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**B.E. Semester –VIII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
Proposed Syllabus under Autonomy Scheme (w.e.f. A.Y. 2020-21)**

B.E. Course					BE Open Elective SEM: VIII					
Course Name : Environmental Management					Course Code: OEC- 8014					
Contact Hours Per Week : 03					Credits : 03					
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)					
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation					
Hours Per Week					Theory (100)	Practical/Oral (25)	Term Work (25)	Total		
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW		
3	–	–	3	3	25	75	–	–	100	
<p align="center">IA: Internal Assessment - Paper Duration – 1.5 Hour ESE: End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance/Learning Attitude (20%)</p>										
Prerequisite: Fundamentals of Chemistry and biology										

Course Objective: The course intends to give an understanding of environmental issues relevant to India and global concerns, the concept of ecology and familiarize the learner with environment related legislations.

Course Outcomes: Upon completion of the course student will be able to:

S. No	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the concept of environmental management and the Energy scenario.	L1 L2
2	Understand ecosystem and interdependence, food chain etc.	L1 L2
3	Understand and interpret environment related legislations	L1 L2 L3 L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of Attainment as per Bloom's Taxonomy
1	Introduction and Definition of Environment	8	L1 L2
	Significance of Environment Management for contemporary managers, Career opportunities, Environmental issues relevant to India, Sustainable Development, the Energy scenario.		
2	Global Environmental concerns	8	L1 L2
	Global Warming, Acid Rain, Ozone Depletion, Hazardous Wastes, Endangered life-species, Loss of Biodiversity, Industrial/Man-made disasters, Atomic/Biomedical hazards, etc.		
3	Concepts of Ecology	8	L1 L2
	Ecosystems and interdependence between living organisms, habitats, limiting factors, carrying capacity, food chain, etc.		
4	Scope of Environment Management	8	L1 L2 L3 L4



Tejasa Single Charitable Trust's (A.K.A.)

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	Role and functions of Government as a planning and regulating agency Environment Quality Management and Corporate Environmental Responsibility.		
5	Total Quality Environmental Management ISO-14000, EMS certification.	8	L1 L2 L3 L4
6	General overview of major legislations Environment Protection Act, Air (P & CP) Act, Water (P & CP) Act, Wildlife Protection Act, Forest Act, Factories Act, etc.	5	L1 L2 L3
	Total	45	

Books and References:

Sr.No.	Title	Author	Publisher	Edition	Year
1	Environmental Management: Principles and Practice	C J Barrow	Routledge Publishers	1st	1999
2	A Handbook of Environmental Management	John C. Lovett and David G. Ockwell	Edward Elgar Publishing	-----	2010
3	Environmental Management	V Ramachandra and Vijay Kulkarni	TERI Press	1st	2006
4	Indian Standard Environmental Management Systems — Requirements With Guidance For Use	Bureau Of Indian Standards	-----	-----	2005
5	Environmental Management: An Indian Perspective	S N Chary and Vinod Vyasulu	Macmillan India	-----	2000
6	Introduction to Environmental Management	Mary K Theodore and Louise Theodore	CRC Press	-----	2009
7	Environment and Ecology	Majid Hussain	Access Publishing	3rd	2015

Online References:

Sr. No.	Website Name	URL
1	Alison	https://alison.com/course/introduction-to-ecology
2	ISO	https://www.iso.org/iso-14001-environmental-management.html
3	<u>Certified Environment Law Analyst</u>	https://www.vskills.in/certification/legal/environment-law-certification



Laajla Singh Charitable Trust's (eKajd.)

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B.E. Semester –VIII
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Proposed Syllabus under Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. Course					B.E. Open Elective SEM: VIII				
Course Name: IPR and Patenting					Course Code: OEC- 8015				
Teaching Scheme (Program Specific)					Examination scheme				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	100
3	-	-	3	3	25	75	-	-	
<p align="center">IA: Internal Assessment - Paper Duration – 1.5 Hours ESE: End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance (20%)</p>									

Course Objective:

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

Course Outcome:

SN	Course Outcomes	Cognitive Levels as per Blooms Taxonomy
1	understand Intellectual Property assets	L1,L2
2	assist individuals and organizations in capacity building	L1,L2,L3
3	work for development, promotion, protection, compliance, and enforcement of Intellectual Property and Patenting	L1,L2,L3

Detailed Syllabus :

Module No.	Topics	Hrs	Cognitive Levels as per Blooms Taxonomy
1	<p>Introduction to Intellectual Property Rights (IPR): Meaning of IPR, Different category of IPR instruments - Patents, Trademarks, Copyrights, Industrial Designs, Plant variety protection, Geographical indications, Transfer of technology etc.</p> <p>Importance of IPR in Modern Global Economic Environment: Theories of IPR, Philosophical aspects of IPR laws, Need for IPR, IPR as an instrument of development</p>	6	L1,L2
2	Enforcement of Intellectual Property Rights:	8	



	Introduction, Magnitude of problem, Factors that create and sustain counterfeiting/piracy, International agreements, International organizations (e.g. WIPO, WTO) active in IPR enforcement Indian Scenario of IPR: Introduction, History of IPR in India, Overview of IP laws in India, Indian IPR, Administrative Machinery, Major international treaties signed by India, Procedure for submitting patent and Enforcement of IPR at national level etc.		L1,L2,L3
3	Emerging Issues in IPR: Challenges for IP in digital economy, e-commerce, human genome, biodiversity and traditional knowledge etc.	6	L1,L2,L3
4	Basics of Patents: Definition of Patents, Conditions of patentability, Patentable and non-patentable inventions, Types of patent applications (e.g. Patent of addition etc), Process Patent and Product Patent, Precautions while patenting, Patent specification Patent claims, Disclosures and non-disclosures, Patent rights and infringement, Method of getting a patent	8	L1,L2,L3
5	Patent Rules: Indian patent act, European scenario, US scenario, Australia scenario, Japan scenario, Chinese scenario, Multilateral treaties where India is a member (TRIPS agreement, Paris convention etc.)	9	L1,L2
6	Procedure for Filing a Patent (National and International): Legislation and Salient Features, Patent Search, Drafting and Filing Patent Applications, Processing of patent, Patent Litigation, Patent Publication etc, Time frame and cost, Patent Licensing, Patent Infringement Patent databases: Important websites, Searching international databases	8	L1,L2,L3
Total Hrs:		45	

Books and References:

S. No.	Title	Authors	Publisher	Edition	Year
1	Patent system and related issues at a glance	Keayla B K	National Working Group	First	2004
2	The enforcement of Intellectual Property Rights	Lous Harns	Wipo	3rd	2018



ज्ञानं शिवाय चरितव्यं नैव (Sanskrit)

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BE SEMESTER VIII

Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019) Proposed Syllabus under Autonomy Scheme (w.e.f. A.Y. 2020-21)

B.E. Course					B.E. Open Elective SEM: VIII				
Course Name: Supply Change Management					Course Code: OEC 8016				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (20)	Term Work (20)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	100
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment- Paper Duration-1.5 Hours ESE : End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance (20%)									
Prerequisite: NIL									

Course Objective:

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

Course Outcome:

SN	Course Outcomes	Cognitive Levels as per Bloom's Taxonomy
1	To acquaint with key drivers of supply chain performance and their inter-relationships with strategy.	L1,L2,L3
2	To impart analytical and problem-solving skills necessary to develop solutions for a variety of supply chain management & design problems.	L1,L3,L4
3	To study the complexity of inter-firm and intra-firm coordination in implementing programs such as e-collaboration, quick response, jointly managed inventories and strategic alliances.	L1,L2,L4



Module	Detailed Contents	Hours	Cognitive Levels as per Bloom's Taxonomy
01	Building a Strategic Framework to Analyze Supply Chains Supply chain stages and decision phases, Process view of supply chain: Supply chain flows, Examples of supply chains, Competitive and supply chain strategies, Achieving strategic fit: Expanding strategic scope, Drivers of supply chain performance. Framework for structuring drivers: inventory, transportation facilities, information obstacles to achieving fit.	07	L1,L2,L3
02	Designing the Supply Chain Network Distribution Networking: Role, Design, Supply Chain Network(SCN):Role, Factors, Framework for design decisions.	07	L1,L3,L4
03	Materials Management Scope, Importance, Classification of materials, Procurement, Purchasing policies, Vendor development and evaluation. Inventory control systems of stock replenishment, Cost elements, EOQ and its derivative modules.	08	L1,L2,L3
04	Dimensions of Logistics Introduction: A Macro and Micro Dimensions, Logistics interfaces with other areas, Approach to analyzing logistics system, Logistics and systems analyzing: Techniques of logistics system analysis, factors affecting the cost and Importance of logistics.	06	L1,L3,L4
05	Warehouse and Transport Management Concept of strategic storage, Warehouse functionality, Warehouse operating principles, Developing warehouse resources, Material handling and packaging in warehouses, Transportation Management, Transport functionality and principles, Transport infrastructure, transport economics and Pricing. Transport decision making.	08	L1,L2,L3
06	IT in Supply Chain 6.1 IT framework, Customer Relationship Management (CRM), internal Supply chain management, Supplier Relationship Management (SRM) and Transaction Management. Coordination in a Supply Chain 6.2 Lack of supply chain coordination and the Bullwhip effect, Obstacle to Coordination, Managerial levers, Building partnerships and trust. Emerging Trends and Issues 6.3 Vendor managed inventory-3PL-4PL, Reverse logistics: Reasons, Role, Activities; RFID systems: Components, Applications, Implementation; Lean supply chain, Implementation of Six Sigma in supply chain, Green supply chain.	09	L1,L3,L4
	Total Hours:	45	



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Open Elective-IV for B.E. Semester–VIII
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(CBCGS- H 2019) TCET Autonomy Scheme (w. e. f. A.Y. 2021-22)



Tagline: Single Charitable Trust's (eKalyan)

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TCET Autonomy Scheme (w.e.f. A.Y. 2021-22)

B.E. Course					B.E. Open Elective SEM: VIII				
Course Name: Managerial Economics					Course Code: OEC 8021				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (20)	Term Work (20)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/ OR	TW	100
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment- Paper Duration-1.5 Hours ESE : End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Financial Accounting									

Course Objective: By the end of the course, students will be able to understand both the theory and practice of Managerial Economics, the students will be in a position to appreciate the finer nuances of the subject, and this subject will help the students in applying the knowledge so acquired in policy planning and managerial decision-making.

Course Outcomes: Upon completion of the course, students will be able to:

Sr. No.	Course Outcomes	Cognitive Levels as per Bloom's Taxonomy
1	Analyze and apply the theory and practice of Managerial Economics	L1,L2,L3,L4
2	Understand the need to locate various factors affecting demand of products and plan marketing & business strategies accordingly. Also they will develop an understanding of the practical application of law of demand.	L1,L2,L3,L4
3	Understand the analytics of supply and demand and its various uses.	L1,L2,L3,L4,L5
4	Understand the holistic approach of production economy.	L1,L2,L3,L4,L5
5	Learn about the intricacies of the various market forms and their impact on the economy and business.	L1,L2,L3,L4,L5
6	Realize the importance of the different methods of capital budgeting as a tool of project management.	L1,L2,L3,L4,L5



Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive Levels as per Bloom's Taxonomy
1	Introduction to Managerial Economics	5	L1,L2,L3,L4
	The meaning, scope and methods of Managerial Economics, Dominic Salvatore model of application of Economics to business decision making. Scarcity, choice & production possibility curve.		
2	Consumer Behavior	11	L1,L2,L3,L4
	Demand, types of demand, factors affecting demand & demand function. Making of linear demand function & linear demand curve. Law of demand. Consumer's surplus. Concept of elasticity of demand and its significance for a businessman. Types of Elasticity – Price Elasticity of Demand, Income Elasticity of Demand, Cross elasticity of demand & Promotional Elasticity of Demand, Demand forecasting – features, significance & methods.		
3	Production Function	5	L1,L2,L3,L4, L5
	Concept, Isoquant & Iso-cost analysis. Laws of returns to scale, economies & diseconomies of scale. Revenue Analysis, Cost analysis and break even analysis		
4	Supply	7	L1,L2,L3,L4, L5
	Concept of supply, factors affecting supply & the law of supply Determination of equilibrium price: effects of changes in demand & supply on equilibrium price.		
5	Types of markets	9	L1,L2,L3,L4, L5
	Perfect competition, monopoly, oligopoly & monopolistic competition – features and price determination. Pricing practices: Factors affecting pricing decision. Marginal cost pricing, mark up pricing, transfer pricing, product line pricing, price skimming and penetration price.		
6	Profit Management	8	L1,L2,L3,L4, L5
	• Profit management • Role of profits in a market economy • Nature and measurement of profit, profit policies • The hypothesis of profit maximization and its alternatives. Demand for capital • Supply of capital • Capital Rationing • Capital Budgeting, Net Present Value (NPV), Internal Rate of Return (IRR). • Appraising - the profitability of projects		
Total Hours		45	



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Website : www.tcetmumbai.in

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Managerial Economics in a Global Economy	Dominick Salvatore	Oxford University Press	Seventh	2011
2	Managerial Economics	Suma Damodaran	Oxford University Press	Second	2010
3	Microeconomics for Business	Satya P Das	SAGE	First	2007
4	Economics	Paul Samuelson and Richard Nordhaus	MIT Press 1998.	FIRST	1998
5	Managerial Economics	Milton Spencer and Louis Siegelman	Palala Press	Second	2015
6	Managerial Economics: Concepts and Cases	Mote, Paul and Gupta	Princeton, 2010	First	2010

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	NPTEL.ac.in	https://nptel.ac.in/courses/110/101/110101005/	M1,M2,M3,M4,M5, M6
2	Udemy.com	https://www.udemy.com/course/introduction-to-managerial-economics/	M1,M2,M3,M4,M5, M6
3	Swayam.ac.in	https://onlinecourses.swayam2.ac.in/imb19_mg16/preview	M1,M2,M3,M4,M5, M6
4	Harvard.edu	https://online-learning.harvard.edu/course/managerial-economics?delta=0	M1,M2,M3,M4,M5, M6
5	Coursera.org	https://www.coursera.org/courses?query=managerial%20economics	M1,M2,M3,M4,M5, M6



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B.E. Semester –VIII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2021-22)

B.E. Course					B.E. Open Elective SEM: VIII				
Course Name: Digital Business Management					Course Code: OEC 8022				
Teaching Scheme (Program Specific)					Examination scheme				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Or al (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	100
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment- Paper Duration-1.5 Hours ESE : End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Digital Marketing									

Course Objective: Students will be learn about intellectual property rights protection system, promote the knowledge of Intellectual Property Laws of India as well as International treaty procedures and get acquaintance with Patent search and patent filing procedure and applications

Course Outcome: Upon completion of the course students will be able to:

SN	Course Outcomes	Cognitive Levels as per Blooms Taxonomy
1	understand Human Resource Management	L1,L2
2	assist Organization of Personnel Functions	L1,L2,L3
3	work for Manpower Planning	L1,L2,L3
4	work for Motivating Employees	L1,L2,L3
5	work for Performance Appraisal Systems and Training	L1,L2,L3
6	work for Development Organisation Development	L1,L2,L3

Detailed Syllabus :

Module No.	Topics	Hrs	Cognitive Levels as per Blooms Taxonomy
1	Introduction to Digital Business- 1.1 Introduction, Background and current status, E-market places, structures, mechanisms, economics and impacts Difference between physical economy and digital economy, 1.2 Drivers of digital business- Big Data & Analytics, Mobile, Cloud Computing, Social media, BYOD, and Internet of Things(digitally intelligent machines/services) 1.3 Opportunities and Challenges in Digital Business,	7	L1,L2
2	Overview of E-Commerce	8	



	<p>2.1 Overview of E-Commerce E-Commerce- Meaning, Retailing in e-commerce-products and services, consumer behavior, market research and advertisement B2B-E-commerce-selling and buying in private e-markets, public B2B exchanges and support services, e-supply chains, Collaborative Commerce, Intra business EC and Corporate portals 2.2 Other E-C models and applications, innovative EC System-From E-government and learning to C2C, mobile commerce and pervasive computing EC Strategy and Implementation-EC strategy and global EC, Economics and Justification of EC, 2.3 Using Affiliate marketing to promote your e-commerce business, Launching a successful online business and EC project, Legal, Ethics and Societal impacts of EC</p>		L1,L2,L3
3	<p>Digital Business Support services 3.1 Digital Business Support services: ERP as e –business backbone, knowledge Tope Apps, Information and referral system 3.2 Application Development: Building Digital business Applications and Infrastructure</p>	7	L1,L2,L3
4	<p>Managing E-Business 4.1 Managing E-Business-Managing Knowledge, Management skills for e-business, 4.2 Managing Risks in e –business Security Threats to e-business -Security Overview, Electronic Commerce Threats, Encryption, Cryptography, Public Key and Private Key Cryptography, Digital Signatures, Digital Certificates, Security Protocols over Public Networks: HTTP, SSL, Firewall as Security Control, Public Key Infrastructure (PKI) for Security, Prominent Cryptographic Applications</p>	8	L1,L2,L3
5	<p>E-Business Strategy- 5.1 E-Business Strategy-E-business Strategic formulation- Analysis of Company's Internal and external environment, Selection of strategy. 5.2 E-business strategy into Action, challenges and E-Transition (Process of Digital Transformation)</p>	7	L1,L2,L3
6	<p>Materializing e-business 6.1 Materializing e-business: From Idea to Realization-Business plan preparation 6.2 Case Studies and presentations</p>	8	L1,L2,L3
	Total Hours:	45	

Books and References:

S. No.	Title	Authors	Publisher	Edition	Year
1	A textbook on E-commerce	Er Arunrajan Mishra, Dr W K Sarwade	Neha Publishers & Distributors	1 st	2011
2	E-commerce from vision to fulfilment	Elias M. Awad,	PHI-Restricted,	1 st	2002
3	Digital Business and E-Commerce Management	Ed, Dave Chaffey,	Pearson,	1 st	August 2014
4	Introduction to E-business-Management and Strategy,	Colin Combe,	ELSVIER	1 st	2006



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5	Digital Business Concepts and Strategy,	Eloise Coupey	Pearson	2 nd Edition,	2009
6	Trend and Challenges in Digital Business Innovation,	Vinocenzo Morabito,	Springer	1 st	
7	Digital Business	Discourse Erika Darics	Palgrave Macmillan	1 st	April 2015
8	E-Governance-Challenges and Opportunities in	Proceedings in 2 nd International Conference theory and practice of Electronic Governance	Oxford Publications	1 st	
9	Perspectives the Digital Enterprise –	A framework for Transformation, TCS consulting journal Vol.5		1 st	
10	Measuring Digital Economy-	A new perspective -	DOI:10.1787/9789264221796-en OECD Publishing	1 st	



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B.E. Semester –VIII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2021-22)

B.E. Course					B.E. Open Elective SEM: VIII				
Course Name: Social Network Analysis					Course Code: OEC 8023				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/OR	TW	100
3	-	-	3	3	25	75	-	-	
IA: In-Semester Assessment- Paper Duration-1.5 Hours ESE : End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Algorithm, Programming									

Course Objective: The Objective of this course is to deliver the fundamental concepts of theory of computation describing formal mathematical models of computation such as FA,PDA,LBA and TM by comparing their power, limitations, languages and their applications in computation and complexity theory and also to learn that not all problems are solvable by computers.

Course Outcomes: Upon completion of the course, students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	understand the basic concepts of social networks	L1, L2, L3
2	understand the fundamental concepts in social network mining	L1, L2, L3
3	understand the modelling and visualization of network	L1, L2, L3
4	understand the concepts of social network graph analysis	L1, L2, L3,L4
5	Perform visualization and exploration using Gephi software.	L1, L2, L3,L4
6	understand the dynamic social networks	L1,L2



Detailed Syllabus:

Module No.	Introduction	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	Introduction Introduction to Semantic Web, the Social Web - Social Network analysis, Development of Social Network Analysis – the concepts and measures in network analysis , Blogs and online communities - Web-based networks - Applications of Social Network Analysis. Advantages and disadvantages in social networks.	9	L1, L2, L3
2	Social Network Mining Introduction to social network mining. Social network extraction from big data, Various social network mining tasks with real-world examples. Community detection and Shingling algorithm, Social Networks as Graphs. Random graph models, ranking algorithms, Graph and Matrices, Basic measures for individuals and networks,	7	L1,L2, L3
3	Modelling and visualization of network Mechanisms : Homophily, Opportunity, and Balance, edges , nodes Analyze a social network by data wrangling and visualizing a network.	7	L1,L2, L3
4	Social Network Graph Analysis Graph kernels, Graph classification, mining and outlier detection, centrality measures , network level measures, partitioning of graphs, components and bridges, cliques	7	L1, L2,L3,L4
5	Gephi Download and Install Gephi, load network data, manipulate the color, structures and shapes ,get Network-Level Measures, centrality measures,	9	L1, L2, L3,L4
6	Dynamic Social Networks Social learning on networks, Information and Biological networks, Various applications of Social Network mining in real world applications, Social Connects: Affiliation and identity	6	L1, L2
	Total Hours	45	

Books and References:

SN	Title	Authors	Publisher	Edition	Year
1	Social Network Data Analytics	Charu C. Aggarwal	Springer	1 st	2011
2	Network Graph Analysis and Visualization with Gephi	Ken Cherven	Packt	1 st	2013
3	Social network analysis: A handbook	Scott, J.	Sage	2 nd	2007
4	Social Network Analysis,	Knoke	Sage	2 nd	2008



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Website : www.tcetmumbai.in

Online References:

S. No.	Website Name	URL	Modules Covered
1	towardsdatascience.com	https://towardsdatascience.com/how-to-get-started-with-social-network-analysis-6d527685d374	M6
2	iopscience.iop.org	https://iopscience.iop.org/article/10.1088/1742-6596/1235/1/012111/pdf	M1-M5



ज्ञानं शिवाय नृणां चरितव्यं (अथर्ववेद)

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Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2021-22)

B.E. Course					B.E. Open Elective SEM: VIII				
Course Name : Taxation for Engineers					Course Code : OEC 8024				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (20)	Term Work (20)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	100
3	-	-	3	3	25	75	--	--	
IA: In-Semester Assessment- Paper Duration-1.5 Hours ESE : End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)									

Course Objective: This course discusses taxation, its principles, its objectives, and its effects; the nature and purposes of taxation, whether taxes should be classified as direct or indirect. It also instils an awareness in students that taxes constitute significant costs to businesses and households and therefore have a major impact in economic and other decision-making, also these costs are potentially controllable through legitimate tax minimisation strategies. The course also shall enable students to appreciate the wider economic, social, administrative-compliance and political contexts within which taxes are imposed.

Course Outcomes: Upon completion of the course, students will be able to:

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the basic principles of taxation in India and the various provisions of Income Tax Act 1961	L2
2	Understand and apply the computation of taxable income under the heads capital gain and other sources	L3
3	Apply the provisions of clubbing of income, set off of losses and deductions permitted under the Income Tax Act, 1961.	L3
4	Analyze the computation of taxable income under the head Salaries, Income from House Property and Profits and Gains of Business or Profession	L4
5	Differentiate between Direct and Indirect Tax	L4
6	Understand the Concept of Service Tax and laws	L2



Detailed Syllabus:

Module No	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	Principles of Taxes	08	L1, L2
	Objectives of Taxation, Principles related to taxation system, Characteristics of good tax system, Effects of Taxation on Production, Distribution and Employment, Taxable capacity – Absolute and Relative Capacity, Factors determining Taxable Capacity, The Income tax Act, 1922, Present system of taxation in India - Income Tax Act 1961		
2	Introduction to Income tax	07	L1, L2, L3
	Basis of Charge, Rates of Tax, Residential Status of Individual, HUF, Firm, Company, AOP/BOI, Local Authority, Practical problems on determination of residential status and incidence of tax, Scope of total income		
3	Incomes Exempt from Tax	07	L1, L2, L3
	Different categories of Exempted Income, Incomes which are neither included in Total Income nor Income Tax is payable, Incomes which are included in Total Income, but no income Tax is payable.		
4	Income from Salaries	08	L1, L2, L3, L4
	Basis of Charge, Different Forms of Salary, Treatment of provident fund, Allowances, Perquisites, treatment of other items included in salary, Profit-in-lieu of Salary Gratuity, Pension and Commuted pension, Encashment of earned leave, Retrenchment compensation, Provident Fund – Types of provident fund and tax treatment, Deductions, Computation of Income from Salary.		
5	Direct and Indirect Taxes	08	L1, L2, L3, L4
	Classification of Taxes, Meaning of direct tax, Basic Concepts: Assessee, Assessment Year, Previous Year, Person, Income, Gross Total Income, Total Income. Meaning of Indirect Taxes, Features, Advantages, Disadvantages, Distinction between Direct and Indirect Taxes, Central Indirect Tax Laws, Indirect Tax Laws of the States, convergence of indirect taxes, Movement to GST		
6	Service Tax	07	L1, L2
	Service Tax Law in India, the concept of 'Negative List', Categorization of Taxable and Tax-free Services, Exemptions and Rebates from Service Tax, Provisions for Rectification of Mistakes and schemes of Assessment		
Total Hours		45	



Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Income Tax	Vinod K. Sinhania & Monica Sinhania	Taxmann Publications Pvt. Ltd	64 th	2020-21
2	Taxation Law & Practice	Mehrotra & Goyal	Sahitya Bhavan Publication	61 st	2020
3	Direct Taxes	Lal B.B	Konark Publishing House	30 th	2012
4	Indirect Taxes	Datey, V.S	Taxmann Publications Pvt. Ltd	44 th	2020
5	Systematic Approach to Income Tax	Girish Ahuja & Ravi Gupta	Bharat Law House Pvt. Ltd	33 rd	2014-15
6	Indirect Taxation	Balachandran. V	Sultan Chand & Sons	18 th	2019



B.E. Semester –VIII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2021-22)

B.E. Course					B.E. Open Elective SEM: VIII				
Course Name: Product Design and Development					Course Code: OEC 8025				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR	TW	
3	-	-	-	3	25	75	-	-	100
<p align="center">IA: In-Semester Assessment - Paper Duration – 1.5 Hours ESE : End Semester Examination - Paper Duration - 3 Hours The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</p>									
Prerequisite: NIL									

Course Objectives: Course intended to deliver the fundamental knowledge of basic principles involved in design of new product and its development.

Course Outcomes: Upon completion of the course, students will be able to:

SN	Course Outcomes	Cognitive levels as per bloom's Taxonomy
1	Identify design and development process of industrial products, considering ergonomic requirements.	L1, L2
2	Explain market requirements and manufacturing aspects of industrial design.	L1, L2, L3
3	Identify consumer products, functions and use.	L1, L2, L3
4	Explain aesthetic concept, symmetry.	L1, L2, L3, L4
5	Explain economic considerations, value analysis and cost reduction.	L1, L2
6	Employ standard organization structure, standardization, record keeping.	L1, L2, L4, L5, L6



Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per bloom's Taxonomy
1	Introduction-Approach to Industrial Design	4	L1, L2
	Approach to industrial product based on idea generation and innovations to meet the needs of the developing society. Design and development process of industrial products, various steps such as creative process involved in idea marketing, designers, mind- criticism, design process, creation. Ergonomics and aesthetic requirements of product design, quality and maintainability consideration in product design, Use of modeling technique, prototype designs, conceptual design.		
2	Industrial Product Design	8	L1, L2, L3
	General design situations, setting specifications, requirements and ratings, their importance in the design, Study of market requirements and manufacturing aspects of industrial designs. Aspects of ergonomic design of machine tools, testing equipment, instruments, automobiles, process equipment etc. Convention of style, form and color of industrial design.		
3	Design of Consumer Product	8	L1, L2, L3, L4
	Functions and use, standard and legal requirements, body dimensions. Ergonomic considerations, interpretation of information, conversions for style, forms, colors.		
4	Aesthetic Concepts	8	L1, L2, L3
	Concept of unity order with variety, concept of purpose, style and environment, Aesthetic expression of symmetry, balance, contrast and continuity, proportion, rhythm, radiation. Form and style of product: visual effect of line and form, mechanics of seeing, psychology of seeing, influence of line and form, Components of style, Basic factors, effect of color on product appearance, color composition, conversion of colors of engineering products.		
5	Economic Considerations	10	L1, L2, L3, L4
	Selection of material, Design for production, use of standardization, value analysis and cost reduction, maintenance aspects in design.		
6	Design Organization	7	L1, L2, L4, L5, L6
	Organization Structure, Designer position, Drawing office procedure, Standardization, record keeping, legal procedure of Design patents.		
	Total Hrs	45	



Books and References:

SN	Title	Authors	Publisher	Edition	Year
1	Industrial Design for Engineers	W. H. Mayall	London Hiffee books Ltd	-	1967
2	Problems of Product Design and Development	Hearn Buck	Pergamon Press	-	-
3	Industrial Designs in Engineering	Charles H. Fluerichem	-	-	-
4	Material of Invention: Materials and Design	Ezio Manzini	The MIT Press	-	1989
5	The Science of Engineering Design	Percy H. Hill	Holt, Rinehart and Winston Publication	-	1970

Online References:

Sr.No.	Website Name	URL	Modules Covered
1	https://nptel.ac.in	https://nptel.ac.in/courses	M1-M6



B.E. Semester –VIII
Choice Based Credit Grading Scheme with Holistic Student Development (CBCGS- H 2019)
TCET Autonomy Scheme (w.e.f. A.Y. 2021-22)

B.E. Course					B.E. Open Elective SEM: VIII				
Course Name: Development Engineering					Course Code: OEC 8026				
Teaching Scheme (Program Specific)					Examination Scheme (Formative/ Summative)				
Modes of Teaching / Learning / Weightage					Modes of Continuous Assessment / Evaluation				
Hours Per Week					Theory (100)		Practical/Oral (20)	Term Work (20)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	IA	ESE	PR/ OR	TW	
3	-	-	3	3	25	75	-	-	100
<p align="center">IA: In-Semester Assessment- Paper Duration-1.5 Hours ESE : End Semester Examination - Paper Duration - 3 Hours</p> <p align="center">The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</p>									
Prerequisite: QSEV, Tender & Contract									

Course Objectives: Students will understand the characteristics of rural Society and the Scope, nature and constraints of rural Development, also provide an exposure to implications of 73rd CAA on Planning, Development and Governance of Rural Areas, exploration of human values, which go into making a ‘good’ human being, a ‘good’ professional, a ‘good’ society and a ‘good life’ in the context of work life and the personal life of modern Indian professionals and get familiarize with the Nature and Type of Human Values relevant to Planning Institutions.

Course Outcomes:

SN	Course Outcomes	Cognitive Levels as per Bloom's Taxonomy
1	Demonstrate understanding of knowledge for Rural Development.	L1, L2, L3, L4
2	Prepare solutions for Management Issues.	L1, L2, L3, L4
3	Take up Initiatives and design Strategies to complete the task	L1, L2, L3, L4
4	Develop acumen for higher education and research.	L1, L2, L3, L4
5	Demonstrate the art of working in group of different nature	L1, L2, L3, L4
6	Develop confidence to take up rural project activities independently	L1, L2, L3, L4



Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive Levels as per Bloom's Taxonomy
1	<p>Introduction to Rural Development Meaning, nature and scope of development; Nature of rural society in India; Hierarchy of settlements; Social, economic and ecological constraints for rural development.</p> <p>Roots of Rural Development in India Rural reconstruction and Sarvodaya programme before independence; Impact of voluntary effort and Sarvodaya Movement on rural development; Constitutional direction, directive principles; Panchayati Raj - beginning of planning and community development; National extension services.</p>	06	L1, L2, L3, L4
2	<p>Post-Independence rural Development Balwant Rai Mehta Committee - three tier system of rural local Government; Need and scope for people's participation and Panchayati Raj; Ashok Mehta Committee - linkage between Panchayati Raj, participation and rural development.</p>	09	L1, L2, L3, L4
3	<p>Rural Development Initiatives in Five Year Plans Five Year Plans and Rural Development; Planning process at National, State, Regional and District levels; Planning, development, implementing and monitoring organizations and agencies; Urban and rural interface - integrated approach and local plans; Development initiatives and their convergence; Special component plan and sub-plan for the weaker section; Micro-eco zones; Data base for local planning; Need for decentralized planning; Sustainable rural development</p>	12	L1, L2, L3, L4



4	Post 73rd Amendment Scenario 73rd Constitution Amendment Act, including - XI schedule, devolution of powers, functions and finance; Panchayati Raj institutions - organizational linkages; Recent changes in rural local planning; Gram Sabha - revitalized Panchayati Raj; Institutionalization; resource mapping, resource mobilization including social mobilization; Information Technology and rural planning; Need for further amendments.	06	L1, L2, L3, L4
5	Values and Science and Technology Material development and its values; the challenge of science and technology; Values in planning profession, research and education Types of Values Psychological values — integrated personality; mental health; Societal values — the modern search for a good society; justice, democracy, rule of law, values in the Indian constitution; Aesthetic values — perception and enjoyment of beauty; Moral and ethical values; nature of moral judgment; Spiritual values; different concepts; secular spirituality; Relative and absolute values; Human values— humanism and human values; human rights; human values as freedom, creativity, love and wisdom	07	L1, L2, L3, L4
6	Ethics Canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility; Work ethics; Professional ethics; Ethics in planning profession, research and education	05	L1, L2, L3, L4
TOTAL		45	

Books and References:

SN	Title	Authors	Publisher	Edition	Year
1	ITPI, Village Planning and Rural Development,	ITPI,	New Delhi	-	-
2	Thooyavan, K.R. Human Settlements:	A 2005 MA Publication, Chennai	A 2005 MA Publication, Chennai	-	-
3	GoI, Constitution (73rdGoI, New Delhi Amendment) Act,	GoI, New Delhi	GoI, New Delhi	-	-
4	Planning Commission, Five Year Plans, Planning Commission	Planning Commission, Five Year Plans, Planning Commission	Planning Commission	-	-



5	Planning Commission, Manual of Integrated District Planning, 2006,	Planning Commission New Delhi	Planning Commission New Delhi	-	-
6	Planning Guide to Beginners	Planning Guide to Beginners	Planning Guide to Beginners	-	-
7	The Urban Complex, Doubleday	Weaver, R.C.,	-	-	-
8	Ethics in Planning, American Planning Association,	Farmer, W.P. et al	Washington		
9	Normative Ethics in Planning, Journal of Planning Literature	How, E.,	Vol.5, No.2, pp. 123-150	-	-
10	Implications for Planning Theory and Ethics, Planning Theory and Practice,	Watson, V. Conflicting Rationalities:	Vol. 4, No.4, pp.395 – 407	-	-