

OPEN ELECTIVE (VI Semester) - 2023-2024

Sl. No.	Code	Name	Number of students	Faculty Name	Dept.
1.	21HU8X03	Intellectual Property Rights (for all)	65	Dr. Ramakrishna B	Humanities
2.	21CV8X07	Environment Impact Assessment (for all except Civil)	65	Ms. Deekshitha K	Civil
3.	21ME8X08	Industrial Pollution Control (for all except Mechanical)	65	Dr. Ravindra	Mechanical
4.	21HU8X24	Professional and Cognitive Communicative (for all)	40	Dr. Vishwanatha	Humanities
5.	21ME8X28	Operations Management and Entrepreneurship (for all except Mechanical)	60	Dr. Kumar H S	Mechanical
6.	21IS8X38	Introduction to Python Programming (for all except CS, CCE, AIML, RAI & IS)	65	Dr. Balasubramani	ISE
7.	21BT8X40	Bio Fuel Engineering (for all except BT)	60	Dr. Santhosh Poojary	BT
8.	21MA8X43	Number Theory (for all)	60	Mrs. Bhavya K	Mathematics
9.	21EC8X59	PCB Design (For all except E&C)	30	Dr. Sukesh Rao M.	E&C
10.	21ME8X63	Innovation & Entrepreneurship (for all)	60	Dr. Vijeesh V	Mechanical
11.	21HU8X68	Introduction to Yoga (for all) (The classes will be conducted from 6.30 a.m. to 7.30 a.m. Those who are willing to come at 6.30 a.m. should only register)	40	Dr. Ajit M Hebbale	Mechanical
12.	21HU8X70	Overview of Indian Culture and Arts (for all)	50	Dr. Bhojaraj B. E/ Dr. Mithun B.M.	Civil
13.	21HU8X71	Principles to Physical Education (for all) (The classes will be conducted from 5.30 p.m. to 6.30 p.m. Those who are willing to come at 5.30 p.m. should only register)	40	Mr. Ganesh Poojary/ Ms. Sowjanya	PED
14.	21HU8X74	Introduction to German Language (for all) (Registration fee for this subject is Rs.500/-)	50	Dr. Shashikanth Karinka	Mechanical
15.	21ME8X75	Sustainable Development Goals (for all)	60	Dr. Udaya	Mechanical
16.	21IS8X76	Web Technologies (for all except CS, IS & AIML)	65	Dr. Naganna Chetty	ISE
17.	21CS8X77	Programming in Java (for all except EC, CS, CCE, AIML & IS)	65	Ms. Aishwarya D Shetty / Mr. Ganesh Pai	CSE
18.	21CS8X78	Data Structures & Algorithms (for all except EC, CS, CCE, AIML & IS)	65	Ms. Savitha Shetty	CSE
19.	21EE8X79	Electric Vehicle Technology (for all except EE & EC)	65	Mr. Naveen J	E&E
20.	21HU8X81	National Cadet Corps: Organization, Functions & Capabilities (for only NCC Cadet Students)	15	Dr. Shivaprasad Shetty M	Chemistry
21.	21EC8X82	Fundamentals of Image Processing – a practical approach (Only for CV, ME & BT)	65	Dr. Mamatha Girish	E&C
22.	21HU8X86	Introduction to Yakshagana (for all - who are familiar with kannada Language)	30	Dr. Janardhana Nayak	Chemistry
23.	21ME8X88	Marketing Management (for all except Mechanical)	60	Dr. Grynal D Mello	Mechanical
24.	21RI8X92	Wheeled Mobile Robot (for all except RAI)	60	Dr. Muralidhar / Mr. Vincent Linish Dsouza	Robotics
25.	21ME8X93	Operations Research (for all except Mechanical & EC)	60	Mr. Manjunath Maiya U	Mechanical
26.	21CC8X94	Next Generation Wireless Networks. (for all except CCE)	60	Dr. Ashish Singh	CCE
27.	21AI8X95	Introduction to Artificial Intelligence & Machine Learning (for all except AIML, RAI, CCE, CS & IS)	60	Ms. Smitha	AIML
Total			1480		

INTELLECTUAL PROPERTY RIGHTS			
Course Code	21HU8X03	Course Type	OEC
Teaching Hours/Week (L:T:P)	3:0:0:0	Credits	03
Total Hours	39+0+0	CIE + SEE Marks	50+50

Teaching Department: Humanities	
Course Learning Objectives:	
1.	Understand the creativity component in intellectual property, different types of legal protection of intellectual properties and other basic concepts of Intellectual property.
2.	Analyze different types of protection for inventions, different types of agreements and treaties for Intellectual properties with an ability to examine patent types, specifications and patent search and database for 'prior art'.
3.	Understand the basic procedure of drafting claims, apply for patents, other legal forms of intellectual property rights and also to examine the protocol involved in protection of inventions like patents.

UNIT - I	
Introduction to Intellectual Property Invention and Creativity - Intellectual Property (IP) – Importance, Jurisprudential definition and concept of property, rights, duties and their correlation; History and evaluation of IPR – like Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications.	8
Agreements and Treaties History - General Agreement on Trade and Tariff (GATT). Indian Position vis-a-vis WTO and Strategies; TRIPS Agreement; Madrid Agreement; Hague Agreement; WIPO Treaties; International convention relating to Intellectual Property - Establishment of WIPO - Mission and Activities – Budapest Treaty; PCT; Indian Patent Act 1970 & recent amendments – Patent (Amendment) Rules, 2017	8
UNIT - II	
Basics of Patents and Concept of Prior Art Introduction to Patents; Types of patent applications: Ordinary, PCT, Conventional, Divisional and Patent of Addition; Specifications: Provisional and complete; Forms and fees Invention in the context of “prior art”; Patent databases; Searching International Databases; Country-wise patent searches (USPTO, EPO, WIPO, IPO, etc.)	8
Patent filing procedures National & PCT filing procedure; Time frame and cost; Status of the patent applications filed; Structure of Patent document, Precautions while patenting – disclosure/non-disclosure; Financial assistance for patenting - introduction to existing schemes; Patent licensing and agreement; Patent infringement-meaning, scope, litigation, case studies	8
UNIT - III	
Case Studies: Patents: Biological Cases - i) Basmati rice ii) Turmeric iii) Neem; Non-biological cases – (i) TVS V/S Hero, (ii) Samsung V/S Nokia – Copyright and related rights – Trade Marks – Trade secrets - Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition; Technology transfer and license agreements (US anti-HIV drug license to Africa)	7

Course Outcomes: At the end of the course student will be able to

1.	Have a General understanding of the Intellectual Property Rights.
2.	Have awareness of different forms of intellectual property rights, national and international IPR related legislations.
3.	Have a general understanding about the provisions, privileges and limitations of intellectual property right holders with an understanding of the legal aspects (civil or criminal) of the use of intellectual property rights.
4.	Acquire Knowledge of National and International Trade Agreements and Agencies functioning in relation to intellectual property rights
5.	Be aware and have a general understanding of patenting procedures and licensing.

Course Outcomes Mapping with Program Outcomes & PSO														
<div>Program Outcomes→</div> <div>↓ Course Outcomes</div> <div>CO1</div> <div>CO2</div> <div>CO3</div> <div>CO4</div> <div>CO5</div>	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓	
													1	2
			3	3	2		3			2	2		3	
		2	2	3			3		3	1	1	2	2	
		2			2		3			2	2	2	3	
				1	1		3			1	2		3	
		3	2	1			3			3	1		2	
1: Low 2: Medium 3: High														
REFERENCE MATERIALS:														
1.	BAREACT, Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd., 2107													
2.	Kankanala C., Genetic Patent Law & Strategy, 1st Edition, Manupatra Information Solution Pvt. Ltd., 2107													
3.	Subbaram N.R. "Handbook of Indian Patent Law and Practice", S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1998.													
4.	Eli Whitney, United States Patent Number: 72X, Cotton Gin, March 14, 1794.													
5.	Intellectual Property Today: Volume 8, No. 5, May 2101,													
6.	WTO and International Trade by M B Rao. Vikas Publishing House Pvt. Ltd.													
7.	Correa, Carlos M. Intellectual property rights, the WTO and developing countries: the TRIPS agreement and policy options, Zed Books, New York 2100													
8.	Wadehra, B. L. Law relating to patents, trademarks, copyright designs & geographical indications 2 ed. Universal Law Publishing 2100													
9.	Sinha, Prabhas Chandra Encyclopedia of Intellectual Property Rights, 3 Vols. Eastern Book Corporation, 2106.													
10	“Practical Approach to Intellectual Property Rights”; Rachna Singh Puri and Arvind Vishwanathan, I. K. International Publishing House Pvt. Ltd.													
E-RESOURCES:														
1.	http://www.w3.org/IPR/													
2.	http://www.wipo.int/portal/index.html.en													
3.	http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html													
4.	www.patentoffice.nic.in													
5.	www.iprlawindia.org/													

ENVIRONMENTAL IMPACT ASSESSMENT			
Course Code	21CV8X07	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to

1. Identify the need to assess and evaluate the impact of projects on environment.
2. Explain major principles of environmental impact assessment.
3. Understand the different steps within environmental impact assessment.
4. Appreciate the importance of EIA for sustainable development and a healthy environment.

UNIT – I

Evolution of EIA: Concepts of EIA, EIA methodologies (Adhoc, Network Analysis, Checklists, Map overlays, Matrix method), Screening and scoping, Rapid EIA and Comprehensive EIA, General Framework for Environmental Impact Assessment, EIA Specialized areas like environmental health impact assessment, Environmental risk analysis.

16 Hours

UNIT - II

Baseline data study, Prediction, and assessment of impacts on physical, biological, and socio-economic environment, Legislative and environmental clearance procedures in India, Public participation, Resettlement, and rehabilitation.

10 Hours

UNIT – III

Fault free analysis, Consequence Analysis, Introduction to Environmental Management Systems, Environmental management plan-Post project monitoring Environmental Audit: Cost Benefit Analysis, Life cycle Assessment. Case studies on project, regional and sectoral EIA.

13 Hours

Course Outcomes:

At the end of the course the student will be able to

1. Understand phenomena of impacts and know the impact quantification of various projects in the environment.
2. Liaise with and list the importance of stakeholders in the EIA process.
3. Know the role of public in EIA studies.
4. Overview and assess risks posing threats to the environment.
5. Assess different case studies/examples of EIA in practice.

Course Articulation Matrix :

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1				2	3	2					2	3	
CO2	1	1				2	3	2					2	3	
CO3	1	1				2	3	2					2	3	
CO4	1	1				2	3	2		3			2	3	
CO5	1	1		3		2	3	2				3	2	3	

Note:- 1:Low 2:Medium 3: High

TEXTBOOKS:

1. Noble, L. 2110. Introduction to environmental impact assessment. A Guide to Principles and Practice. 2nd edition. Oxford University Press, Don Mills, Ontario.
2. Larry W. Canter, Environmental Impact Assessment, McGraw Hill Inc. Singapore, 1996

ADDITIONAL REFERENCE MATERIALS

1. Morris and Therivel, 2109. Methods of Environmental Impact Assessment, 3rd edition. New York, NY: Routledge.
2. Hanna, K.S. 2109. Environmental impact assessment. Practice and Participation. 2nd edition. Oxford, University Press, Don Mills, Ontario.

NPTEL SOURCES

<http://nptel.ac.in/courses/121108004/>

<http://nptel.ac.in/courses/121108004/module3/lecture3.pdf>

INDUSTRIAL POLLUTION CONTROL			
Course Code	21ME8X08	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives: This Course will enable students to,	
1	Know the Consequences of pollution, relationship between man and environment over the last few decades, necessity of modern awareness on pollution and how carbon audit can help in developing a carbon strategy.
2	Identify the Importance of Meteorology in pollution control and global warming, various types of plume dispersions and its effect; analyze various levels of plume height for different pollutants.
3	Distinguish Particulates and fly ash separation techniques such as cyclone separator, electrostatic precipitator efficiency calculations etc.
4	Illustrate Formation, measurement and control techniques for Smoke and gaseous pollutants.
5	Summarize the Effects of water, soil, plastics and odor pollution their control techniques, Different Pollution Control Acts, Legal aspects of pollution control and how these acts can help in bringing down the pollution rate.
UNIT - I	
Introduction to Pollution Man and the environment, types of pollution and its consequences, Changing environmental management concept, sustainable industrial growth, carbon audit, Ill effects of various pollutants, permissible concentration levels & AQI. Meteorology Meteorology, Wind rose, Lapse rate, plume dispersion studies & Numerical problems 15 Hours	
UNIT - II	
Separation techniques Different types of Particulates, Need for Separation techniques, Sources of Particulates Matter Fly Ash Electrostatic precipitator (Problems) Theory of settling processes (Design Problems), Bag House fabric filter Cyclone separator Spray Tower Scrubbers & Venturi Scrubber Smoke and gaseous pollutants Smoke- White, blue and black smoke, Sources of smoke, T,T,T-O Principle of smoke Measurement of stack smoke intensity using Ringlemann Chart and Smokescope & Bosch Smoke meter, Domestic and Industrial Incinerators-Design factors, Pollutant gaseous So ₂ , Co, UBHC, Nox their ill effects and & control methods.. 15 Hours	
UNIT - III	
Water, soil, noise, and odor pollution, their control methods, problems associated with nuclear reactors, Legal aspects of pollution control in India, brief details of Euro and BS standards. 9 Hours	

Course Outcomes:

At the end of the course the student will be able to

CO 1	Identify the various types of pollutants and distinguish between them with regards to Particulate matters and AQI.
CO 2	Outline the instruments for Meteorological measurements, distinguish types of plume dispersions and its effect; analyze the concentration of various gaseous pollutants from T-Z diagrams.
CO 3	Explain the Particulates and fly ash separation techniques, compare and Interpret their efficiency.
CO 4	Illustrate Formation, measurement and control techniques for Smoke and gaseous pollutants
CO 5	Identify Effects of water, soil, plastics and odor pollution on environmental Pollution and explain the Legal aspects of pollution control.

TEXTBOOKS:

1. "Environmental Pollution Control Engineering, Wiley Eastern Ltd.,
2. "Introduction to Environmental Engineering & Science", Gilbert M Masters, PHI, 1995
3. "Environmental Pollution Control Engineering, C. S RAO New Age Int.

REFERENCE BOOKS:

1. "Air Pollution", Henry C. Perkins, Mc-Graw Hill, 1974.
2. "Air Pollution control", W. L. Faith, John Wiley

MOOC/NPTEL Resources:

1. <http://nptel.ac.in/courses/105106119/36>

Course Articulation Matrix

Course Code / Name : 21ME8X08/ Industrial Pollution Control														
Course Outcomes (CO)	Program Outcomes (PO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C-21ME8X08.1	2								1	1		1		
C-21ME8X08.2	2								1	1		1		
C-21ME8X08.3	2								1	1		1		
C-21ME8X08.4	2								1	1		1		
C-21ME8X08.5	2								1	1		1		

1: Low 2: Medium 3: High

Scheme of SEE Question Paper

There will be **8** questions of **21** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I** & **Unit – II** and **1** full question from **Unit – III**.

PROFESSIONAL & COGNITIVE COMMUNIQUÉ			
Course Code	21HU8X24	Course Type	OEC
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Credits	03
Total Teaching Hours	39+0+0	CIE + SEE Marks	50+50
Teaching Department: Humanities			
Course Learning Objectives:			
1.	To Problematize Commonsense & Apply Critical thinking skills		
2.	Comprehend etiquettes and manners in different situations		
3.	Be gender sensitive in both offline and online behavior		
4.	Exhibit better comprehension of the social implications of human body		
5.	Understand the importance of reading and writing skills		
UNIT - I			
Common sense and Emotional Intelligence Common sense, Commonsensical Consensus, Critical thinking, Unsettling commonsensical Consensus, Role of language in Common sense and Critical Thinking; Nature & Functions of Emotional Intelligence, Emotions, Intelligence and Creativity, Growth of Emotional Intelligence			15
Etiquettes & Workplace Etiquette, Workplace Etiquettes, Workplace Readiness Skills, Significance of Cross-Cultural Understanding; Cultural Sensitivity, Impact of social media in Workplace			
UNIT - II			
Social Networking Sites and its Impacts Emergence of social media, Impact on Gender and Self Representation, Regulatory and Liberatory aspects of social media, Offline Norms & Online Behaviour			15
Gender and Body Gender & Sex, Genderization, Homogeneity and Heterosexuality, Gender Expressions, Gender Schooling, Representations of Body, Objectification, Gender Perspectives of Body, Different Ways of Seeing the Body, Discipline & Coercion, ISA & RSA			
UNIT - III			
Writing Types of Writing, Note Taking Methods, Plagiarism Reading Styles of Reading, Types of Reading, Scanning, Skimming			9

Course Outcomes: At the end of the course student will be able to															
1.	Problematicize Commonsense & Apply Critical thinking skills														
2.	Comprehend etiquettes and manners in different situations														
3.	Be gender sensitive in both offline and online behavior														
4.	Exhibit better comprehension of the social implications of human body														
5.	Understand the importance of reading and writing skills														
Course Outcomes Mapping with Program Outcomes & PSO															
	Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓	
	↓ Course Outcomes													1	2
	CO1		3							3	3		3		
	CO2		2						3	2	3		2		
	CO3		3							2	2		3		
	CO4		3							2	2		3		
	CO5		2							3	3		2		
1: Low 2: Medium 3: High															
REFERENCE MATERIALS:															
1.	Geetha.V. Gender. Kolkatta: Web Impressions, 2109.														
2.	Bailey, Jane, et al. "Negotiating with Gender Stereotypes On Social Networking Sites: From "Bicycle Face" to Facebook." Journal of Communication Enquiry 37.2 (2113): 91-112.														
3.	Barry, Peter. Beginning Theory. New Delhi: Viva Books, 2110.														
4.	Berger, John. Ways of Seeing. London: Penguin Books, 1977.														
5.	Cranny-Francis, Anny, et al. Gender Studies: Terms and Debates. New York: Palgrave Macmillan, 2103.														
6.	Gauntlett, David. Media, Gender and Identity: An Introduction. London: Routledge, 2108														
7.	Pilcher, Jane, and Imelda Whelehan. 50 Key Concepts in Gender Studies. London: Sage, 2104. Print.														
8.	Jeanne, Haraway Donna. Simians, Cyborgs, and Women. London: Free Association Books, 1991. Web.														
9.	Koskela, Hille. "Webcams, TV Shows and Mobile Phones: Empowering Exhibitionism." Surveillance & Society 2.3 (2104): 199-215.Web.														
E-RESOURCES:															
1.	http://www.cyberpsychology.eu/view.php?cisloclanku=2109061501/ >.														
2.	http://www.surveillance-and-society.org/articles2(2)/webcams.pdf														
3.	http://eprints.rclis.org/19790/ >.														

OPERATIONS MANAGEMENT & ENTREPRENEURSHIP				
Course code		21ME8X28	CIE Marks	50
Teaching Hours/Week (L:T:P)		(3:0:0)	SEE Marks	50
Total Hours		39	Credits	03
Course Learning Objectives: This Course will enable students to,				
1	Define production/operations management, Classify Production and service system and different type of production systems, Understand the importance of CRM and ERP			
2	Appreciate the importance of Quality tools and methods in operations management			
3	Analyze the data draw variable process control charts and determine process capability; Understand salient issues concerning reliability			
4	Understand the issues related to entrepreneurship, characteristics of an entrepreneur and different studies carried out during project appraisal.			
5	Identify and differentiate the different national and state level funding agencies.			
UNIT – I				
Introduction to Production/ Operations Management: Concept of production, Classification of production systems, Production Management, Concept of operations, Distinction between Manufacturing Operations and Service Operations, Objectives of Operations Management (Customer Service and Resource utilization/ Competitive advantage through Quality-Delivery-Cost), Scope of Operations Management. Introduction to				

Customer Relationship Management (CRM) and Enterprise Resource Planning (ERP).	
	7 Hours
Introduction to Quality Concepts: The Meaning of Quality and Quality Improvement, Key dimensions of Quality, Concept of cost of quality. Customers' perception of quality.	
TOTAL Quality Management: Definition, Principles of TQM, Gurus of TQM, Benefits of TQM.	
Managing Quality: Quality circles, Continuous Improvement- Juran's Trilogy, PDCA cycle, Kaizen, 7 QC tools,	
Philosophy of statistical process control and modeling process quality: Normal distribution tables, Finding the Z score, Central limit theorem, Chance and assignable causes of variation, Statistical Basis of the Control Charts (basic principles, choices of control limits, significance of control limits, warning limits)	
	9 Hours
UNIT – II	
Control charts for variables: Control Charts for X-Bar and R- Charts, Type I and Type II errors, Simple Numerical Problems,	
Process capability: The foundation of process capability, Natural Tolerance limits, c_p – process capability index, c_{pk} , p_p – process performance index, summary of process measures. Numerical problems. Concept of Six sigma.	
Introduction to reliability, Mean time to failure, Mean time between failures, Bath tub curve, Reliability of series and parallel systems, Numerical problems on the above topics.	
	8 Hours
Entrepreneurship: Concept of Entrepreneurship, Stages in entrepreneurial process, Role of entrepreneurs in Economic Development, Barriers to Entrepreneurship, Meaning of Entrepreneur, Functions of an Entrepreneur, Types of Entrepreneurs, Intrapreneur - an emerging Class.	
Identification of business opportunities: Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study.	
Application of Operations Management concepts in Facility/ Business Location: General procedure for making locations decisions, Numerical Problems on application of Breakeven analysis and Transportation method to make location decisions.	
	8 Hours
UNIT – III	
Small scale industries: Definition; Characteristics; Need and rationale; Objectives; Scope; role of SSI in Economic Development. Advantages of SSI, Steps to start and SSI, Government policy towards SSI; Different Policies of SSI, Impact of Liberalization, Privatization, Globalization on SSI. Effect of WTO/GATT on SSI, Supporting Agencies of Government for SSI, Ancillary Industry and Tiny Industry (Definition Only)	
Institutional Support: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single Window Agency; SISI; NSIC; SIDBI; KSFC.	
	7 Hours

Course Outcomes (CO)

CO 1	Differentiate production and service systems. Discuss continuous and intermittent production systems with their advantages and disadvantages. Discuss CRM and ERP systems.
CO 2	Discuss Total Quality Management tools and methods. Solve problems on fundamentals of statistics and normal distribution.
CO 3	Draw and Analyze variable process control charts and determine process capability. Calculate reliability of series and parallel systems using the information on failure rate and time.
CO 4	Discuss entrepreneurship, characteristics of an entrepreneur and barriers to entrepreneurship. Discuss the elements of a project report and feasibility studies conducted in the project appraisal.
CO 5	Identify and differentiate the national and state level funding agencies. Discuss the effect of GATT and WTO on Indian economy.

TEXTBOOKS:

- Production / Operations Management**, Joseph G Monks, McGraw Hill Books
- Production and Operations Management**, William J Stevenson, Tata McGraw Hill, 8th Edition.
- Statistical Quality Control**: RC Gupta, Khanna Publishers, New Delhi, 2105.
- Total Quality Management**: Dale H. Besterfield, Pearson Education, 2103.
- Dynamics of Entrepreneurial Development & Management** – Vasant Desai – Himalaya Publishing House
- Entrepreneurship Development** – Poornima.M.Charantimath – Small Business Enterprises – Pearson Education – 2106 (2 & 4).

REFERENCE BOOKS:

1. **Statistical Quality Control:** E.L. Grant and R.S. Leavenworth, 7th edition, McGraw- Hill publisher.
2. **Statistical Process Control and Quality Improvement:** Gerald M. Smith, Pearson Prentice Hall. ISBN 0 – 13-049036-9.
3. **Statistical Quality Control for Manufacturing Managers:** W S Messina, Wiley & Sons, Inc. New York, 1987
4. **Statistical Quality Control:** Montgomery, Douglas, 5th Edition, John Wiley & Sons, Inc. 2105, Hoboken, NJ (ISBN 0-471-65631-3).
5. **Principles of Quality Control:** Jerry Banks, Wiley & Sons, Inc. New York.
6. **Entrepreneurship Development** – S.S.Khanka – S.Chand & Co.

MOOC/NPTEL Resources:

1. <http://nptel.ac.in/courses/110105067/>
2. <https://www.edx.org/course/operations-management-iimb-om101-1x>

Course Articulation Matrix

Course Code / Name: 18ME8X28/ Operations Management & Entrepreneurship															
Course Outcomes (CO)	Program Outcomes (PO)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C-21ME8X28.1	3	1	0					1	1	1	1				
C-21ME8X28.2	1	2	0						1	1	3				
C-21ME8X28.3	2	2	0				1	0	1	1	3				
C-21ME8X28.4	3	1	0			1	0	1	1		2				
C-21ME8X28.5	1	1	0			1	1	1	1		3				

1: Low 2: Medium 3: High

Scheme of SEE Question Paper

There will be **8** questions of **21** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I** & **Unit - II** and **1** full question from **Unit - III**.

INTRODUCTION TO PYTHON PROGRAMMING			
Course Code	21IS8X38	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Prerequisites:

Student must have fundamental knowledge of procedure-oriented programming.

Course Learning Objectives (CLOs):

At the end of the course student should be able to:

- Construct Python programs using data types and looping.
- Design object-oriented Python programs using classes and objects.
- Design useful stand-alone and CGI applications in Python.

UNIT - I

INTRODUCTION: Introduction to python, Installing Python; basic syntax, interactive shell, editing, saving, and running a script. The concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; comments in the program; understanding error messages. Conditions, Boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation.

STRING MANIPULATIONS: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa, Binary, octal, hexadecimal numbers

LISTS, TUPLES, AND DICTIONARIES: Basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.

15 Hours

UNIT – II

FUNCTIONS: Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions

CLASSES AND OOP: Classes, objects, attributes and methods; defining classes; design with classes, data modelling; persistent storage of objects, inheritance, polymorphism, operator overloading (`_eq_`, `_str_`, etc); abstract classes; exception handling, try block

15 Hours

UNIT – III

FILE HANDLING: Manipulating files and directories, Reading from Text Files, Writing to Text Files, Reading from Binary Files, Writing to Binary Files, Seeking Within Files, Creating and Reading a formatted file (csv or tab-separated).

GRAPHICAL USER INTERFACES: event-driven programming paradigm; creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames Simple CGI form

9 Hours

Course Outcomes:

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C8X38.1	Demonstrate the basics of Python programming like data types and looping	L2
C8X38.2	Apply the basic data structures in solving the problems	L3
C8X38.3	Experiment with usage of functions in a given problem	L3
C8X38.4	Develop Objects by creating classes and apply object-oriented features	L3
C8X38.5	Develop applications in Python using File Programming & User Interface	L3

Table: Mapping of COs to PIs, POs and BTL

Course Outcomes (COs)	Program Outcomes (POs) Addressed	Performance Indicators (PI)	Bloom's Taxonomy Level (BTL)
CO1	1,2,3	1.4.1,1.3.1,2.1.1,2.1.2,2.2.4,3.1.1	L2
CO2	1,2,3	1.4.1,1.3.1,2.3.1,3.1.1,3.2.2	L3
CO3	1,2,3	1.4.1,1.3.1,2.1.1,2.1.2,2.2.4,3.1.1,3.1.6,3.2.1,3.2.2	L3
CO4	1,2,3	1.4.1,1.3.1,2.1.1,2.1.2,2.2.4,3.1.1,3.1.6,3.2.1,3.2.2	L3
CO4	1,2,3	1.4.1,1.3.1,2.1.1,2.1.2,2.2.4,3.1.1,3.1.6,3.2.1,3.2.2	L3

Mapping Course Outcomes with Programme Outcomes:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C8X38.1	1	2	1											
C8X38.2	1	2	1										2	2
C8X38.3	1	2	2										2	3
C8X38.4	1	2	2										2	3
C8X38.5	1	2	2										2	3

(L/1=Low30%-49%,M/2=Medium50%-69%,H/3=High>70%)

TEXTBOOK:

- 1) Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2111, Cengage Learning, ISBN: 978-1111822705

ADDITIONAL RESOURCES:

1. Think Python. PDF is free.

SEE Question Paper Pattern:

There will be **8** questions of **21** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit - II** and **1** full question from **Unit - III**.

BIOFUEL ENGINEERING			
Course Code	21BT8X40	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Prerequisites: Nil

Co-requisites: Nil

Course Learning Objectives:

The objective of this course is

- To learn the fundamental concepts of biofuels, types of biofuels, their production technologies.
- To learn the concepts of feedstock utilization and energy conversion technologies.

UNIT – I**LIQUID BIOFUELS**

Description and classification of Biofuels; Primary biomass: Plant materials-Woody biomass, Lignocellulosic and agroindustrial by-products, starchy and sugary crops. Secondary biomass: Waste residues and co-products-wood residues, animal waste, municipal solid waste. Biomass production for fuel – algal cultures, yeasts (Lipid and carbohydrate).

Production of biodiesel: Sources of Oils – edible and non edible; Esterification and Transesterification. Free fatty acids; saponification; Single step and two step biodiesel production. Catalysts for biodiesel production – homogeneous (alkali/acidic) and heterogeneous; Lipase mediated process. General procedure of biodiesel production and purification Quality Control Aspects: GC analysis of biodiesel, fuel property measurements, ASTM (D-6751) and Indian standards (IS15607). Algal Biodiesel production.

Production of Bioethanol: Bioethanol production using Sugar; Starch and Lignocellulosic feedstocks; Pretreatment of lignocellulosic feed stock

15 Hours

UNIT – II**BIOHYDROGEN AND MICROBIAL FUEL CELLS**

Enzymes involved in H₂ Production; Photobiological H₂ Production: Biophotolysis and Photofermentation; H₂ Production by Fermentation: Biochemical Pathway, Batch Fermentation, Factors affecting H₂ production, Carbon sources, Detection and Quantification of H₂. Reactors for biohydrogen production.

Microbial Fuel cells: Biochemical Basis; Fuel Cell Design: Anode & Cathode Compartment, Microbial Cultures, Redox Mediators, Exchange Membrane, Power Density; MFC Performance Methods: Substrate & Biomass Measurements, Basic Power Calculations, MFC Performance: Power Density, Single vs Two-Chamber Designs, Wastewater Treatment Effectiveness; Advances in MFC.

15 Hours

UNIT – III**RECOVERY OF BIOLOGICAL CONVERSION PRODUCTS**

Biogasification of municipal solid waste: Anaerobic processing; Types of digesters, Biogas plant in India.

Thermochemical processing: Planning an incineration facility, Incineration technologies: Mass burning system; Refuse derived fuel (RDF) system; modular incineration; Fluidized bed incineration; energy recovery; Fuel production through biomass incineration, Pyrolysis and gasification, hydrothermal processing.

9 Hours

Course Outcomes:

At the end of this course, student should be able to:

1. Mark the significance of biofuels and raw materials and Identify suitable feedstock for production of biofuels.
2. Illustrate the production of liquid biofuels from various feed stocks.
3. Demonstrate production of biohydrogen using microbial sources.
4. Extend the concepts of microbial fuel cells towards development of specific application.
5. Understand and apply the concepts of biochemical processing to harvest energy from waste products/streams.

Mapping of POs & COs:

	PO											
CO	1	2	3	4	5	6	7	8	9	10	11	12
CO1		M							L			
CO2		M							L			
CO3		M							L			
CO4		M							L			
CO5		M							L			

REFERENCE BOOKS:

1. Drapcho, C. M., Nhuan, N. P. and Walker, T. H. *Biofuels Engineering Process Technology*, Mc Graw Hill Publishers, New York, 2108.
2. Jonathan R.M, *Biofuels – Methods and Protocols (Methods in Molecular Biology Series)*, Humana Press, New York, 2109.
3. Olsson L. (Ed.), *Biofuels (Advances in Biochemical Engineering/Biotechnology Series)*, Springer-Verlag Publishers, Berlin, 2107.
4. Glazer, A. and Nikaido, H. *Microbial Biotechnology – Fundamentals of Applied Microbiology*, 2 Ed., Cambridge University Press, 2107.
5. Godfrey Boyle (Ed). *Renewable Energy- Power for sustainable future*, 3rd Ed. Oxford. 2112.
6. Ramachandran, T. V. *Management of municipal solid waste*. Environmental Engineering Series. Teri Press, 2116.

SEE QUESTION PAPER PATTERN:

Unit No.	I	II	III
Questions to ask (21 marks/Qn)	3	3	2
Questions to answer	2	2	1

NUMBER THEORY			
Course Code	21MA8X43	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

1.	Understand the divisibility of integers ,study of prime numbers and basic properties of congruences.
2.	Study Fermat's little theorem and understand Euler's function.
3.	Study the existence of primitive roots and quadratic residues.
4.	Study the cryptographic applications in number theory.

UNIT – I

Divisibility and the theory of congruences

Division algorithm, Euclid's algorithm for the greatest common divisor. Linear Diophantine equations. Prime numbers, fundamental theorem of arithmetic. Basic properties of congruences, Linear congruences and Chinese remainder theorem.

15 Hours

UNIT - II

Fermat's theorem, Wilson's theorem, Euler's Phi function, Euler's theorem.

Primitive roots and Quadratic congruences

16 Hours

Order of an integer modulo n , primitive roots for primes, Euler's criterion, Legendre symbol and its properties

UNIT - III

Cryptography

Introduction to public key cryptography, RSA cryptosystem, an application of primitive roots to cryptography

8 Hours

Course Outcomes: At the end of the course student will be able to

1.	Use divisibility and Greatest common divisor in Euclidean algorithm. Solve Diophantine equations. Identify prime factorization of an integers.
2.	Understand the properties of congruences. Use Chinese remainder theorem to find solution of system of linear congruences
3.	Use Fermat's Little Theorem and Wilson's Theorem. Use of Euler's Phi function.
4.	Identify primitive roots of an integers. Apply Euler's criterion and Legendre symbols.
5.	Code and decode numbers in the RSA cryptosystem.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12
↓ Course Outcomes												
CO1	2	3										
CO2	2	3										
CO3	2	3										
CO4	2	3										
CO5	2	3										

1: Low 2: Medium 3: High

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student must obtain minimum of 40% marks individually both in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration). Based on this grading will be awarded.

Continuous Internal Evaluation:

- | | |
|----|--|
| 1. | Methods recommended: Two Tests (80%), Written Quiz (10%) and module assignments (10%). |
| 2. | The class teacher must decide the topic for closed book test and Written Quiz. In the beginning only teacher must announce the methods of CIE for the subject. |

Semester End Examination:

There will be **8** questions of **20** marks each in the question paper categorized into **3 Units** as per the syllabi & contact hours. The student will have to answer **5** full questions, selecting **2** full questions each from **Unit - I & Unit – II** and **1** full question from **Unit – III**.

TEXTBOOKS:	
1.	D. Burton; Elementary Number Theory, McGraw-Hill, 2005
2.	Niven, H.S. Zuckerman & H.L. Montgomery, Introduction to the Theory of Numbers, Wiley, 2000.
REFERENCE BOOKS:	
1.	H. Davenport, The Higher Arithmetic, Cambridge University Press, 2008.
2.	G.A. Jones & J.M. Jones, Elementary Number Theory, Springer UTM, 2007.
3.	Thomas Koshy, Elementary Number Theory with Applications, 2nd edition, Elsevier, 2007
4.	Fundamentals of Number Theory by William J. LeVeque
E Books / MOOCs/ NPTEL	
1.	http://refkol.ro/matek/mathbooks/ro.math.wikia.com%2520wiki%2520Fisiere pdf incarcate/Elementary-Number-Theory.pdf
2.	https://nptel.ac.in/courses/111104138
3.	https://nptel.ac.in/courses/111103020

PCB DESIGN			
Course Code	21EC8X59	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Pre-requisites:

Basic electrical and electronics engineering.

Course Learning Objectives:

1. To enable students to gain knowledge of Schematic Design techniques & PCB design techniques
2. To expose students to complete PCB Design & manufacturing process

List of Experiments

- Introduction to PCB design tool: building a schematic circuit and layout
- Exploring the PCB design tool by creating new components, using existing components and footprint, simulation features, Active & Passive Components
- Drawing a PCB layout in a single layer with constraints such as board area, track width, packages, via etc
- Creating a double layer PCB for a given schematic circuit
- Creating and using different component package types
- Fabrication of single and double layer PCB on a copper clad board using hatching/engraving technique.
- Handling PCB prototype machine using Mach3 CNC tool for the PCB prototype.

Detailed Course Plan

Lab 1

Introduction to PCB design tool : building a schematic circuit.

Lab 2

Creating Library & Components, using existing components and footprint, simulation features, Active & Passive Components.

Lab 3

Designing a single layer PCB for given schematic circuit diagram, Gerber file generation.

Lab 4

Designing a double layer PCB for given schematic circuit diagram, Gerber file generation.

Lab 5

Simulating digital and analog circuits for given test cases.

Lab 6

Handling programmable microcontroller circuit in the simulation environment of schematic editor .

Lab 7

Defining a footprint for a component in the PCB layout.

Lab 8

Fabrication of single layer PCB using PCB prototype machine – Generating bit file in Copper Cam tool.

Lab 9

Fabrication of single layer PCB using PCB prototype machine – Setting up Mach3 CNC tool.

Lab 10

Fabrication of double layer PCB using PCB prototype machine – Generating bit file in Copper Cam tool.

Lab 11

Fabrication of double layer PCB using PCB prototype machine -Setting up Mach3 CNC tool.

Lab 12

Component placement and soldering.

Lab 13

Desoldering and testing.

Scheme of SEE Examination

It is a 3-Hour exam at the end of the semester where the student is to demonstrate the PCB designing process.

Sl.No	Activity	Max. Marks
1	Creating schematic for a given circuit diagram	15
2	PCB Layout design	21
3	Setting up fabrication	15
Total		50

Course Outcomes:

At the end of the course the student will be able to

1. Draw schematic circuit and create PCB layout for single or multilayer PCB
2. Fabricate single and double-layer PCB using Mach3Mill operated CNC machine.

INNOVATION AND ENTREPRENEURSHIP			
Course Code	21ME8X63	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Prerequisites:

The student must have learnt basics of Engineering concepts, applications and business as a whole.

Course Learning Objectives: This Course will enable students to,

1	Understand Technological Innovation
2	Understand Innovation management and the difference between Invention and Innovation.
3	Appreciate the importance of Innovation as management process and Innovation management techniques.
4	Define Innovation system and Understand the importance of Technology management and Transfer.
5	Identify Technological Entrepreneurship and its types and Understand the Institutional support provided for Entrepreneurs

UNIT – I	
INTRODUCTION TO TECHNOLOGICAL INNOVATION	14 Hours
Basic Concepts and Definitions: Technology - Technology Management – Invention – Creativity – Innovation - The Concept of Technological Innovation - Innovation Posture, Propensity and Performance - Innovation Measurement - Key factors linking creativity and innovation – Classifications of Innovations – Innovation Process.	
INTRODUCTION TO INNOVATION MANAGEMENT	
Innovation Management Through Management of Knowledge and Education – Types of Learning - Difference Between Innovation and Invention - Types and Characteristics of Innovation.	
INNOVATION AND COMPETITIVENESS	
Case Study – Barriers for Innovation and Competitiveness.	
UNIT – II	
INNOVATION AS A MANAGEMENT PROCESS	14 Hours
Activities to enhance companies capacity for innovation – Management of Technological Innovation: Corporate Perspective, National Perspective, Theoretical Perspective and Individual Perspective - Challenges in Technological Innovation Management - Case Study in Technological Innovation Management - Innovation Management Techniques (IMTs).	
INNOVATION SYSTEMS	
The Concept of Innovation Systems - Innovation Systems: Sectoral, Regional, National.	
TECHNOLOGY MANAGEMENT AND TRANSFER	
Technology Transfer - Impacts of MNCs in technology transfer -	
UNIT – III	
INTRODUCTION TO TECHNOLOGICAL ENTREPRENEURSHIP	11 Hours
Types of Entrepreneurship: Mixed Entrepreneurship, Pure Entrepreneurship, Social Entrepreneurship, Collaborative Entrepreneurship, Internal Entrepreneurship, External Entrepreneurship - Sustainable Entrepreneurship -	
INSTITUTIONAL SUPPORT	
Business Incubator (Bi) - Determination of the Five Incubator Services - Incubation Centres in India – Atal Incubation Centre – Startup India - NSIC, KIADB, KSFC.	

<u>Course Outcomes (CO):</u>	
At the end of the course the student will be able to,	
CO 1	Describe technological innovation and its key features for business.
CO 2	Describe innovation management and difference between invention and innovation.
CO 3	Explain innovation as a management process, its management and perspectives. Understand Innovation management techniques.
CO 4	Explain innovation system, technology management and transfer.
CO 5	Explain technological entrepreneurship and institutional support.
<u>TEXTBOOK:</u>	
1	Carayannis, Elias G., Samara, Elpida T., Bakouros, Yannis L., “Innovation and Entrepreneurship Theory, Policy and Practice”, Springer, 2115.
<u>REFERENCE BOOKS:</u>	
1	Dick Whittington, “Digital Innovation and Entrepreneurship”, Cambridge University Press, 2118.

Course Articulation Matrix:

Course Code / Name : 21ME8X63/ INNOVATION AND ENTREPRENEURSHIP														
Course Outcomes (CO)	Program Outcomes (PO)												PSO	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C-21ME8X63.1	3	2				1	1		1			1	3	1
C-21ME8X63.2	3	2				1	1		1			1	3	1
C-21ME8X63.3	2	2				1	1		1			1	3	1
C-21ME8X63.4	2	2				1	1		1			1	3	1
C-21ME8X63.5	3	2				1	1		1			1	3	1

1: Low 2: Medium 3: High

Scheme of SEE Question Paper

There will be **8** questions of **21** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III**.

INTRODUCTION TO YOGA				
Course Code:	21HU8X68	Course Type	OEC	
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Credits	03	
Total Teaching Hours	39	CIE + SEE Marks	50+50	

Teaching Department: Mechanical Engineering

Course Learning Objectives:

1.	To give a brief history of the development of Yoga
2.	Identify names of different classical texts on Yoga
3.	To illustrate how Yoga is important for healthy living
4.	To explain the Asanas and other Yogic practices
5.	To explain, how Yoga practices can be applied for overall improvement

UNIT – I

Yoga: Meaning and initiation, definitions and basis of yoga, History and development, Astanga yoga, Streams of yoga. Yogic practices for healthy living. General guidelines for Yoga practices for the beginners: Asanas, Pranayama.	09 Hours
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Classification of Yoga and Yogic texts:Yogasutra of Patanjali, Hatha yogic practices- Asanas, Pranayama, Dharana, Mudras and bandhas.	07 Hours
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UNIT – II	
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Yoga and Health: Concept of health and Diseases-Yogic concept of body – pancakosaviveka, Concept of disease according to Yoga Vasistha.	06 Hours
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Yogic concept of healthy living- rules & regulations, yogic diet, ahara, vihara. Yogic concept of holistic health.	04 Hours
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Applied Yoga for elementary education:Personality development- physical level,mental level,emotional level. Specific guidelines and Yoga practices for - Concentration development,Memory development	04 Hours
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UNIT - III	
Yoga and physical development: Mind-body, Meditation, Yogasanas and their types, Different Yoga	05 H

practices and Benefits.	05 Hours
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Specific guidelines and Yoga practices for – Flexibility, Stamina, Endurance (Surya Namaskara)	04 Hours
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Course Outcomes: At the end of the course student will be able to

1.	Understand a brief history of the development of Yoga
2.	Know important practices and principles of Yoga
3.	Explain how Yoga is important for healthy living
4.	Practice meditation to improvement of concentration etc.
5.	Have knowledge about specific guidelines of yoga practices

Course Outcomes Mapping with Program Outcomes & PSO

↓ Course Outcomes	Program Outcomes→												PSO↓	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1						1			1			1		
CO2						1			1			3		
CO3						2			1			3		
CO4						3			2			3		
CO5						2			2			3		

1: Low 2: Medium 3: High

TEXTBOOKS:	
1.	B.K.S. Iyengar, “Light on Yoga: The Classic Guide to Yoga by the World’s Foremost Authority”, Thorsons publisher 2116.
2.	MakarandMadhukar Gore, “Anatomy and Physiology of Yogic Practices: Understanding of the Yogic Concepts and Physiological Mechanism of the Yogic Practices”, MotilalBanarsidass Publishers; 6 edition (2116).
3.	Swami SatyanandaSaraswati, “Asana, Pranayama, Mudra and Bandha: 1”, Yoga Publications Trust.
REFERENCE BOOKS:	
1.	Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice by Ann Swanson
2.	Yoga for Everyone : 50 Poses For Every Type of Body by Dianne Bondy
E Books / MOOCs/ NPTEL	
1.	https://onlinecourses.swayam2.ac.in/aic19_ed29/preview
2.	https://youtu.be/FMf3bPS5wDs

OVERVIEW OF INDIAN CULTURE AND ART				
Course Code		21HU8X70	Course Type	OE
Teaching Hours/Week (L:T:P: S)		3:0:0:0	Credits	03
Total Teaching Hours		39+0+0	CIE + SEE Marks	50+50
Teaching Department: Humanities				
Course Learning Objectives:				
1.	To understand the relevance of Culture in Human Life, dynamism of Indian Culture and Arts through ages.			
2.	To understand the local culture and its vibrancies.			
3.	To develop awareness about Indian Society, Culture and Arts under Western rule.			
4.	To comprehend different dimension and aspects of the Indian culture and arts.			
5.	To appreciate cultural performances in India.			
UNIT - I				
Knowing Culture What is Culture, Different aspects of Culture, Cultural expression, Importance of Culture				7
Influence of Culture Relationship of Culture with: Language, Religion and History, Gender				7
UNIT - II				
Media and Culture Role of News Papers, Indian Cinema, Music, Advertisements				7
Languages, Literature and Culture Role of Sanskrit, Vedas, Upanishads, Ramayana and Mahabharata, Puranas, other Sanskrit Literature, Buddhist and Jain Literature, Dravidian Languages and Literature, North Indian Languages and Literature, Subaltern Literature				7

UNIT - III															
Arts and Culture Indian Theatre and Performing Arts, Ritual performances, and Tuluva cultural and ritual performances.													7		
(Self-study Component) Contribution of Indian History to Culture Ancient India – Persian and Macedonian invasions and its impact on Indian Culture, Development of Culture and Arts during the Mauryan Empire (Ashoka), the Guptas, the South Indian Dynasties – the Cholas, Nalanda as a Centre of Learning. Medieval India – Life of People under Delhi Sultanate, Rise of Islam and Sufism, Political Scene of India, Bhakti Movement, Folk Arts, Rise of Modern Indian Languages. Modern India – British Ruling and its impact on Indian Culture, Social and Religious Reforms, Indian National Movement and Achievement of Independence.													4		
Course Outcomes: At the end of the course student will be able to															
1.	Examine how the culture has a very important role in human life and growth of human civilization and have a general awareness on historical perspective of growth of Indian Culture and Arts.														
2.	Appreciate their own local culture from an academic perspective.														
3.	Know about the impact of Western Rule in India and Indian Struggle for Freedom and also its impact on Indian Culture and Arts and able to appreciate and the role of language in connecting people, growth of culture and arts beyond the barriers of religion and ages.														
4.	Take interest in learning these forms of arts, and also appreciate and preserve them for the future generations feeling proud of Indian Culture, Arts and Architecture.														
5.	Appreciate art performances in India which will enable them to get exposed to an artistic sphere, which eventually help them to be creative and imaginative.														
Course Outcomes Mapping with Program Outcomes & PSO															
Program Outcomes→		1	2	3	4	5	6	7	8	9	10	11	12	PSO↓	
↓ Course Outcomes														1	2
CO1			1				3		3	3	1		3		
CO2					2		3		2	3	3		3		
CO3							3		1				1		
CO4							3		2	1	2		3		
CO5							3		3	3	3		2		
1: Low 2: Medium 3: High															

PRINCIPLES TO PHYSICAL EDUCATION			
Course Code	21HU8X71	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to

1. Appreciate and understand the value of physical education and its relationship to a healthy active lifestyle.
2. Work to their optimal level of physical fitness.
3. Show knowledge and understanding in a variety of physical activities and evaluate their own and others' performances.

UNIT - I

History of Physical Education - Olympic games, Modern Olympic games, Olympic Ideals & Objectives, Olympic Symbols, Olympic Flag, Olympic Emblem, Olympic Motto, Olympic Flame, Asian games

International Olympic Committee (IOC), Indian Olympic Association (IOA)

Sports awards - Eligibility, Objectives & Criteria

Yoga - Meaning and Importance

World Health organization (WHO)

10 Hours

UNIT – II

Concept of Health - Meaning of Health, Health Definition, Factors Affecting Health, Qualities of Healthy Person. Health Hazards of College Students, Physical Fitness and Exercises.

Food and Nutrition - Food & Nutrition Defined, Nutrients and their Functions - i) Proteins ii) Carbohydrates iii) Fats iv) Vitamins

Balanced Diet & Malnutrition

Health Education - Meaning of Health Education, Health Education Defined, Scope of Health Education, Importance of Health Education.

Posture - Concept of Posture, Correct Postures, Common Postural Defects

First Aid - First Aid Defined, Need and importance of First Aid, The Requisites of First Aid, Scope of First Aid, Qualities of a First Aider, Fundamental Principles to be followed and the Duties to be performed by the First Aider, First Aid in Different Cases.

Physical Education - Concept of Physical Education, Physical Education Defined, Importance of Physical Education, Scope of Physical Education, Aims and Objectives of Physical Education.

Teaching Aid in Physical Education

Competition - Introduction, Types of competition, Knock out, League or Round Robin Tournament.

12 Hours

UNIT – III

Training in Sports – Meaning, Principles, Warming Up & Limbering Down

Importance of Anatomy and Physiology in Physical Education, Oxygen Debt and Second wind

Leadership and Supervision – Leadership, Qualities of a good leader in Physical Education, Types of Leadership in Physical Education - 1. Teacher Leadership 2. Student Leadership.

Measurement & specification of various playing fields – Cricket, Volley Ball, Basket Ball, Badminton, Ball Badminton, Foot Ball, Hand Ball & their basic playing skills.

16 Hours

Course Outcomes:

At the end of the course, the student will be able to

1. Demonstrate an understanding of the principles and concepts related to a variety of physical activities.
2. Apply health and fitness principles effectively through a variety of physical activities.
3. Support and encourage others (towards a positive working environment).
4. Show self-motivation, organization and responsible behavior.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→ ↓ Course Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓	
													1	2
CO1						3			2	1		1		
CO2						3			2	1		1		
CO3						3			2	1		1		
CO4						3			2	1		1		
CO5						3			2	1		1		

1: Low 2: Medium 3: High

TEXT AND REFERENCE BOOKS:

1. A. K. Uppal, “Physical Education and Health”
2. M. L. Kamlesh, “Fundamental Elements of physical Education”,
3. Swami Ramdev, “Yog its philosophy and practice”, Divya Prakashan
4. V. K. Sharma, “Health and Physical Education”

INTRODUCTION TO GERMAN LANGUAGE			
Course Code	21HU8X74	Course Type	OEK
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Credits	03
Total Teaching Hours	39+0+0	CIE + SEE Marks	50+50
Teaching Department: Mechanical			
Course Objectives:			
1.	Distinguish - definite and indefinite articles, declension of singular and plural nouns by adding certain endings to them to differentiate between subjects, objects and indirect objects and construct sentences of simple day to day usage.		
2.	Differentiate between nomnative and akkusative cases with transitive and intransitive verbs, and negation with Kein/e/er		
3.	Differentiate use of dative object besides the subject for some specific verbs and Apply the grammar principles of use of personal pronoun as a substitute for noun as per the case, number and gender of the noun.		
4.	Differentiate preposition forms when used exclusively in akkusative or Dative forms or on combination of the two cases		
5.	Differentiate conjugation of verbs in present, present-perfect and past participle tenses, separable and inseparable verbs, application of conjugation of modal verbs and position of modal verb in a sentence.		
UNIT - I			
Introduction: Mein Name ist (saying who you are, greeting people and saying goodbye, asking people where they come from and where they live. Language point: I and you), Lesen der politischenKarte der Welt, Nationalitaeten und Spachen, Die Uhrzeit (The time) telling time and talking about daily routine, Tage der Woche, die Monate, die vierJahreszeiten, die Jahre Mir gehes gut: Asking people how they are, saying how you are, saying which cities and counries people come from, Language points: verb endings), Wieschreibt man das (how do you write that?) Counting from 1-100 and above, alphabet, spelling our names and words, talking about us and them. Language points: Yes-no questions Artikel (Articles): As in English, there are definite (der/die/das) and indefinite (ein/eine) articles: the □ der/die/das; a/an □ ein/eine Die vierFälle (The four cases): Nominativ, Akkusativ, Dativ, Genitiv(Not in level A-1) Deklination des bestimmtenArtikels der/die/das Deklination des unbestimmtenArtikelsein/eine (Deklination/Declension: the variation of the form of a noun, pronoun, or adjective, by which its grammatical case, number, and gender are identified) Deklination von Substantiven (Declension of nouns) (Singular and Plural) (German nouns are declined by attaching certain endings to them, according to case, number and gender. This helps to differentiate between subjects, objects and indirect objects). Nominativ und Akkusativ(nominative and accusative cases) The verb determines the case of the noun. Some verbs only go with the nominative, others only with the accusative (or the dative). Thus, German verbs are either transitive or intransitive. (Nominative and accusative cases) Intransitive Verben (intransitive verbs) Transitive Verben (transitive verbs) Negation „kein/e/er “(negation with „kein/e/er “) (Singular und Plural) The negation of the indefinite article (ein/eine/ein) is kein/keine/kein. For this, you just have to put a „k“ at the beginning of the declined form of ein/eine/ein. Peter siehteinHaus. □ Negation □ Peter siehtkeinHaus. (Peter sees a house. □ negation □ Peter does not see a house.) (With examples, writing and hearing exercises, and German to English Glossary as applicable)			13
UNIT - II			
Dativ (the dative) (You are already familiar with verbs which require a direct accusative object in addition to the subject, which is in the nominative case. But there also some verbs which require a dative object besides the subject. To identify the dative object you ask “(To) whom?”) Der Plural (the plural)			13

<p>There are many different forms of the plural in the German language. Principally, the gender and the ending of the noun determine the plural form. Then, you either attach a plural ending to the noun, change a vowel, or keep the noun as it is in the singular.</p> <p>Das Personalpronomen (the personal pronoun) The personal pronoun is a substitute for a noun. Its forms are determined by the case, number and gender of the noun which is to be replaced.</p> <p>Die Formen des Personalpronomen im Nominativ (The nominative forms of the personal pronoun):</p> <p>Präpositionen (prepositions) German prepositions are followed by an object, either in the accusative or the dative case. Some prepositions always take an accusative object, others always a dative object. But there are also prepositions which can be followed by both. In this case, the question “Where(to)?” (□ accusative) or “Where?” (□ dative) determines the case of the object.</p> <p>Präpositionen mit Akkusativ und Dativ (Prepositions with accusative and dative)</p> <ol style="list-style-type: none"> 1. Präpositionen mit Akkusativ (prepositions with accusative) 2. Präpositionen mit Dativ (prepositions with dative) 3. Präpositionen mit Akkusativ oder Dativ (prepositions with accusative or dative) <p>(With examples, writing and hearing exercises, and German to English Glossary as applicable)</p>	
UNIT - III	
<p>Konjugation von Verben im Präsens (Conjugation of verbs in present tense) Verbs are conjugated by attaching certain endings, depending on the person and number of the subject.</p> <p>Trennbare und untrennbare Verben (separable and inseparable verbs) Verbs with prefixes are distinguished between separable and inseparable verbs. The prefix of an inseparable verb must never be separated from the stem. Here the stress is on the stem: bekommen. The prefix of a separable verb gets separated from the stem when the verb is conjugated. In the infinitive, the stress is on the prefix: an-kommen</p> <ol style="list-style-type: none"> 1. Trennbare Verben (separable verbs) 2. Untrennbare Verben (inseparable verbs) <p>Konjugation von Verben im Perfekt (Conjugation of verbs in present perfect) The present perfect (Perfekt) describes something which happened in the past and is especially used in spoken German. It is formed with the present tense form of „haben“ or „sein“ and the past participle of the main verb.</p> <ol style="list-style-type: none"> 1. Die Bildung des Partizips (the formation of the past participle) 2. Die Bildung des Perfekts mit „haben“ und „sein“ (the formation of the present perfect with „haben“ and „sein“) <p>Modalverben (modal verbs) A modal verb is rarely used as a main verb; instead, it usually modifies the main verb. While the main verb remains in the infinitive, the modal verb is conjugated. In German, there are 7 modal verbs: können (can/be able), dürfen (may/be allowed), wollen (want), müssen (must/have to), sollen (shall), mögen (to like), möchten (wish/would like)</p> <ol style="list-style-type: none"> 1. Konjugation der Modalverben (Conjugation of the modal verbs) 2. Stellung des Modalverbs im Satz (Position of the modal verb within a sentence) <p>(With examples, writing and hearing exercises, and German to English Glossary as applicable)</p>	13

Course Outcomes: At the end of the course student will be able to																
1.	Distinguish - definite and indefinite articles, declension of singular and plural nouns by adding certain endings to them to differentiate between subjects, objects and indirect objects and construct sentences of simple day to day usage.															
2.	Differentiate between nomnative and akkusative cases with transitive and intransitive verbs, and negation with Kein/e/er															
3.	Differentiate use of dative object besides the subject for some specific verbs and Apply the grammar principles of use of personal pronoun as a substitute for noun as per the case, number and gender of the noun.															
4.	Differentiate preposition forms when used exclusively in akkusative or Dative forms or on combination of the two cases															
5.	Differentiate conjugation of verbs in present, present-perfect and past participle tenses, separable and inseparable verbs, application of conjugation of modal verbs and position of modal verb in a sentence.															
Course Outcomes Mapping with Program Outcomes & PSO																
	Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓		
	↓ Course Outcomes													1	2	
	HU1502-1.1						3			2	1		1			
	HU1502-1.2						3			2	1		1			
	HU1502-1.3						3			2	1		1			
	HU1502-1.4						3			2	1		1			
	HU1502-1.5						3			2	1		1			
1: Low 2: Medium 3: High																
TEXTBOOKS:																
1.	Ulrich Haessermann, Georg Dietrich, Christianne C. Guenther, Diethelm Kaminski, Ulrike Woods and Hugo Zenker, Sprachkurs Deutsch Neusaffung 1, UnterrichtswerkfuerErwachsene, Verlag Moritz Diesterweg, Universitaetsdruckerei H. Stuertz AG Wuerzburg, 1989															
2.	Paul Coggle and HeinerSchenke, Teach Yourself German (a complete course in understanding, speaking and writing), Teach Yourself Books, Hodden& Stoughton Educational, UK, 2101															
3.	Langenscheidt German In 30 Days: Book + Cd Paperback, www.amazon.in, – 1 September 2111															
REFERENCE MATERIALS:																
1.	Deutsche SprachlehrefürAusländer.															
2.	ThemenAktuell (Text and workbook).															
3.	Deutsch alsFremdsprache 1A.															
4.	Tangram Aktuell 1A/1B (Text and workbook).															
5.	Wherever required the Videos/Audios are also played in the class room sessions															
E-RESOURCES:																
1.	https://onlinecourses.nptel.ac.in/noc21_hs30/preview NPTEL-Swayam, German-I by Prof. MilindBrahme IIT Madras															
2.	https://www.trainerman.com/en/ powered by Sprachinstitut TREFFPUNKT Online															

SUSTAINABLE DEVELOPMENT GOALS			
Course code	21ME8X75	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03
Course Learning Objectives: Sustainable Development Goals is a 2116 United Nations officially released Agendas for Sustainable approach environmental integrity, economic viability and a just society for present and future generations. It aims to provide the knowledge, skills, attitudes and values necessary to address sustainable development challenges. They address the global challenges we face, including poverty, inequality, climate change, environmental degradation, peace and justice. Learn more and take action. This SDG program is organized in such a way to be research-led, applied interdisciplinary program that considers sustainability in both developed and developing societies, and addresses critical global challenges put forth by UN.			
UNIT – I			
The origin, development and idea of the SDGs History and origins of the Sustainable Development Goals. What are the SDGs? What are their aims, methodology and perspectives? How are they related to the Millennium Development Goals? SDGs and Society: Ensuring resilience and primary needs in society In-depth discussion and analysis of goals related to poverty, hunger, health & well-being and education			
			13 Hours
UNIT – II			
SDGs and Society: Strengthening Institutions for Sustainability In-depth discussion and analysis of goals related to gender equality, affordable and clean energy, sustainable cities & communities, and peace, justice & strong institutions SDGs and the Economy: Shaping a Sustainable Economy In-depth discussion and analysis of goals related to work & economic growth, industry, innovation & infrastructure, inequalities, responsible production & consumption			
			13 Hours
UNIT – III			
SDGs and the Biosphere: Development within Planetary Boundaries In-depth discussion and analysis of goals related to clean water, climate, life below water and life on land Realizing the SDGs: Implementation through Global Partnerships In-depth discussion and analysis of SDG 17 which aims to implement the SDGs through partnerships, finance, technology and the development of coherence between policies.			
			13 Hours

Course Outcomes:

At the end of the course the student will be able to

CO 1	Summarize the UN's Sustainable Development Goals and how their aims, methodology and perspectives.
CO 2	Analyze the major issues affecting sustainable development and how sustainable development can be achieved in practice.
CO 3	Identify and apply methods for assessing the achievement/possibilities of sustainable development in Nitte gram panchayath.
CO 4	Evaluate the implications of overuse of resources, population growth and economic growth and sustainability & Explore the challenges the society faces in making transition to renewable resource use
CO 5	Create skills that will enable students to understand attitudes on individuals, society and their role regarding causes and solutions in the field of sustainable development.

TEXTBOOKS:

1. Sachs, Jeffrey D. The age of sustainable development. Columbia University Press, 2115
2. Gagnon, B., Leduc, R., and Savard, L., Sustainable development in engineering: a review of principles and definition of a conceptual framework. Cahier de recherche / Working Paper 08-18, 2108.
3. Dalby, Simon, et al. Achieving the Sustainable Development Goals: Global Governance Challenges. Routledge, 2119.
4. Sustainability: A Comprehensive Foundation by Tom Thesis and JonathanTomkin, Editors.

REFERENCE BOOKS:

1. Elliott, Jennifer. An introduction to sustainable development. Routledge, 2112.
2. Day, G.S., and P.J.H. Schoemaker (2111), Innovating in uncertain markets: 10 lessons for green technologies, MIT Sloan Management Review, 52.4: 37-45.

MOOC Resources:

1. <https://www.un.org/sustainabledevelopment/poverty/>

Course Articulation Matrix

Course Code / Name : 21ME/ SUSTAINABLE DEVELOPMENT GOALS														
Course Outcomes (CO)	Program Outcomes (PO)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	2	1	1	1	3	3	1	1	1		2	1	1
2	2	2	1	1	1	3	3	2	1	1		1	1	1
3	3	2	2	1	1	3	3	2	3	1		1	1	2
4	3	2	3	1	1	3	3	2	1	1		1	3	2
5	1	2	2	1	1	3	3	2	2	2		1	1	1

1: Low 2: Medium 3: High

Scheme of SEE Question Paper

There will be **8** questions of **21** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III**.

WEB TECHNOLOGIES			
Course Code	21IS8X76	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives (CLOs):

At the end of the course student should be able to:

- Illustrate the Semantic Structure of HTML and CSS
- Compose forms and tables using HTML and CSS
- Design Client-Side programs using JavaScript and Server-Side programs using PHP
- Illustrate the Database connectivity using PHP
- Examine JavaScript frameworks such as jQuery

UNIT - I

Introduction to HTML- Html tags and simple HTML forms, web site structure, HTML table, Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colours and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.

15 Hours

UNIT - II

Client side Scripting: Introduction to JavaScript: JavaScript language – declaring variables, scope of variables functions, event handlers (on click, on submit etc.), Document Object Model, Form validations. Introduction to PHP: Declaring variables, data types, arrays, strings, operations, expressions, control structures, functions, Reading data from web form controls like Text Boxes, radio buttons, lists etc.,

15 Hours

UNIT – III

PHP Databases: Basic command with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, File Handling in PHP, PHP Arrays and Superglobals, Arrays, \$_GET and \$_POST Superglobal Arrays, jQuery Introduction: What is jQuery, Adding jQuery in to your web pages, jQuery Syntax, jQuery Selectors, jQuery Events.

9 Hours

Course Outcomes:

Sl. No.	Course Outcome (CO)	Bloom's Taxonomy Level (BTL)
C8X52.1	Adapt HTML and CSS syntax and semantics to build web pages	L2
C8X52.2	Construct and visually format tables and forms using HTML and CSS	L3
C8X52.3	Experiment with the usage of Event handling and Form validation using Java script	L3
C8X52.4	Understand the principles of object oriented development using PHP and Database concepts	L2
C8X52.5	Inspect JavaScript frameworks like jQuery which facilitates developer to focus on core features.	L2

Table: Mapping of COs to PIs, POs and BTL

Course Outcomes (COs)	Program Outcomes (POs) Addressed	Performance Indicators (PI)	Bloom's Taxonomy Level (BTL)
CO1	1,3	1.3.1,1.4.1,3.2.1,	L2
CO2	1,2,3	1.4.1,3.2.1,3.2.2,2.1.1,2.2.4,3.1.6	L3
CO3	1,3	1.4.1,3.2.1,3.2.2,3.4.3	L3
CO4	1,2,3	1.4.1,3.2.1,3.2.2,2.1.1,2.2.4,3.1.6	L2
CO5	1,3	1.4.1,3.2.1,3.2.2	L2

Mapping Course Outcomes with Programme Outcomes:

POs COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C8X52.1	1	2		2								1	2	
C8X52.2	1			2								1	2	
C8X52.3	1	2		2	3							1	2	
C8X52.4	1	2		2	3							1	2	
C8X52.5	1			2	3							1	2	

(L/1=Low30%-49%,M/2=Medium50%-69%,H/3=High>70%)

TEXTBOOK:

- Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 1st Edition, Pearson Education India. (ISBN:978-9332575271)

E RESOURCES:

- nptel.ac.in/courses/106105084/11

SEE Question Paper Pattern:

There will be **8** questions of **21** marks each in the question paper divided into **3 Units** as per the syllabus & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit – III**.

PROGRAMMING IN JAVA			
Course Code	21CS8X77	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This course will enable students to:

1. Learn fundamental features of object oriented language and JAVA programming constructs.
2. Develop and run simple Java programs using OOPS concepts of java
3. Create multi-threaded programs and event driven Graphical User Interface (GUI) programming using swing package.

UNIT – I

Introduction to Java: Java's magic: The Byte code; Java Development Kit (JDK); the Java Buzzwords, Object-oriented programming; Simple Java programs. Data types, variables and arrays, Operators, Control Statements.

Classes, Inheritance: Classes fundamentals; Declaring objects; Call by value and Call by Reference, array of objects, Constructors, this keyword, and usage of static keyword.

Inheritance: inheritance basics, using super, creating multi-level hierarchy, method Overriding, abstract classes, final classes.

15 Hours

UNIT – II

Exception handling, packages and interfaces: Exception handling in Java, use of try, catch blocks, multiple catch blocks, finally block, use of throw and throws clauses, creating custom exceptions. Packages, Access Protection, Importing Packages, Interfaces. IO Streams for file handling.

Multi-Threaded Programming:

What are threads? How to make the classes threadable; Extending threads; Implementing runnable interface; creating multiple threads, join and is Alive methods of Thread class, Thread Synchronization; achieving thread synchronization among multiple threads. Thread priorities, methods to get and set thread priority

15 Hours

UNIT – III

Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model;

Swings:

The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; JLabel and ImageIcon; JTextField; The Swing Buttons; JTabbedPane; JScrollPane; JList; JComboBox; JTable.

09 Hours

Course Outcomes:

Upon completion of this course, students will be able to:

1. Apply the object-oriented concepts to solve real world problems using JAVA programming features
2. Illustrate the basic constructs and object oriented features of the Java language
3. Design a multi-threaded program using Java with exception handling
4. Develop Java programs that includes packages and interfaces and perform file operations in Java
5. Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using swings

Table-2: Mapping Levels of COs to POs / PSOs															
COs	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3			2				1	1		1	2	3	
CO2	1	2	2		1				1	1		1		3	
CO3	1	2	3		1				1	1		1		3	2
CO4	1	2	3		1				1	1		1	2	3	3
CO5	1	2	3		1				1	1		1		3	3

Graduate Attributes (GA)

This course will map the following GA as per NBA:

1. Design/Development of Solutions
2. Problem Analysis
3. Modern tool usage

TEXTBOOK:

1. Herbert Schildt, Java the Complete Reference, 7th Edition, Tata McGraw Hill, 2107. (Chapters 2-11, 22-24, 29,30)

REFERENCE BOOKS:

1. Mahesh Bhawe and Sunil Patekar, "Programming with Java", First Edition, Pearson Education, 2108, ISBN:9788131721806
2. Rajkumar Buyya, S Thamaras Selvi, Xingchen Chu, Object oriented Programming with Java, Tata McGraw Hill Education Private Limited.
3. Richard A Johnson, Introduction to Java Programming and OOAD, CENGAGE Learning.
4. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill Companies.

E-Books / Online Resources:

1. Online course material by Oracle :
<http://docs.oracle.com/javase/tutorial/index.html>
2. <https://www.udemy.com/courses/search/?q=java&price=price-free&view=grid>

MOOC:

1. Oracle: www.oracle.com/events/global/en/java.../java-a-beginners-guide-1721064.pdf
2. NPTEL: www.nptelvideos.com/java/java_video_lectures_tutorials.php

SEE SCHEME:

There will be **8** questions of **21** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit - II** and **1** full question from **Unit - III**.

DATA STRUCTURES AND ALGORITHMS			
Course Code	21CS8X78	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This course will enable students to:

1. **Outline** the concepts of data structures, its types, structures and pointers.
2. **Understand** linear data structures, namely, stack, queue, singly linked list and doubly linked list.
3. **Analyze** nonlinear data structures, namely, binary tree and graphs.
4. **Analyze** the non-recursive and recursive algorithms and to represent Efficiency of these algorithms in terms of the standard Asymptotic notations.
5. **Explain** the various algorithm design techniques and apply them to solve various real world problems.

UNIT – I

INTRODUCTION:

Data Structure, Classification (Primitive and non-primitive), data structure operations.

POINTERS:

Definition and Concepts, Accessing variables through pointers, Arrays and pointers. Structures, pointers to structures.

LINEAR DATA STRUCTURES – STACKS:

Introduction and Definition, Representation of stack: Array and structure representation of stacks, Operations on stacks using C functions (Push(), Pop(), IsStackFull(), IsStackEmpty()).

LINEAR DATA STRUCTURES – QUEUES:

Introduction and Definition Representation of Queue: Array and Structure representation of queue, Operations on Ordinary Queue using C functions (Insert(), Remove(), IsQueueFull(), IsQueueEmpty())

15 Hours

UNIT – II

LINEAR DATA STRUCTURES - SINGLY LINKED LISTS:

Dynamic Memory allocation functions. Definition and concepts singly linked List: Representation of link list in memory, Operations on singly Linked List using C functions (Insert node at front, Remove a node from front, display singly linked list).

LINEAR DATA STRUCTURES - DOUBLY LINKED LISTS:

Doubly Linked List: Representation. (Operations not included).

NONLINEAR DATA STRUCTURES – BINARY TREES:

Binary Trees: Properties, Linked representation of Binary Tree, Binary Tree Traversals, Introduction to Binary Search Tree.

INTRODUCTION TO ALGORITHMS:

What is an Algorithm? Fundamentals of Algorithmic Problem Solving, understanding and representing graphs using adjacency matrix and linked list.

FUNDAMENTALS OF THE ALGORITHMS EFFICIENCY:

Analysis Framework, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-recursive and Recursive Algorithms.

15 Hours

UNIT – III

DECREASE & CONQUER:

Concept of Decrease and Conquer, Graph traversal algorithms - Depth First Search, Breadth First Search.

DYNAMIC PROGRAMMING:

Concept of Dynamic Programming, Computing a Binomial Coefficient.

GREEDY METHOD:

Concept of Greedy technique, Prim's algorithm.

BACKTRACKING:

Concept of Backtracking technique, N-Queens problem.

9 Hours

Course Outcomes:

1. **Acquire** the fundamental knowledge of various types of data structures and pointers using that knowledge, analyze and design the programs using pointers
2. **Apply** the fundamental programming knowledge of data structures to analyze and design linear data structures, namely, stack, queue, singly linked list and doubly linked list and use them for solving problems.
3. **Implement** and apply the concept of binary trees and graph data structures and also understand their traversals.
4. **Analyze** non-recursive or recursive algorithm and to represent in terms of standard Asymptotic notations.
5. **Apply** Divide and Conquer, Decrease and Conquer, Dynamic programming, Greedy, and Backtracking algorithm design techniques to solve real time problems.

Table-2: Mapping Levels of COs to POs / PSOs															
COs	Program Outcomes (POs)												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2						1				1	3		
CO2	3	1	2					1				1	3		
CO3	3	2						1				1	3		
CO4	2	3												2	
CO5	2	2	3	2	3				1			1		3	
3: Substantial (High)				2: Moderate (Medium)						1: Poor (Low)					

TEXTBOOKS:

1. Aaron M. Tenenbaum, Yeddyah Langsam & Moshe J. Augenstein, “Data Structures using C”, Pearson Education/PHI, 2106.
2. Anany Levitin, “Introduction to the Design & Analysis of Algorithms”, 2nd Edition, Pearson Education, 2107.

REFERENCE BOOKS:

1. Ellis Horowitz and Sartaj Sahni, “Fundamentals of Data Structures in C”, 2nd edition, Universities Press, 2114.
2. Seymour Lipschutz, “Data Structures, Schaum’s Outlines”, Revised 1st edition, McGraw Hill, 2114.
3. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, “Introduction to Algorithms”, 2nd Edition, PHI, 2106.

MOOCs:

1. Introduction to Data Structures by edx , URL: <https://www.edx.org/course/>
2. Advance Data Structures by MIT OCW , URL: <https://www.mooclab.club/>
3. Data Structure by Harvard Extension School, URL: <http://www.extension.harvard.edu>
4. <http://nptel.ac.in/courses/106101060/>

SEE SCHEME:

There will be **8** questions of **21** marks each in the question paper divided into **3 Units** as per the syllabi & contact hours and the student will have to answer **5** full questions, selecting **2** full questions from **Unit - I & Unit – II** and **1** full question from **Unit –III**

ELECTRIC VEHICLE TECHNOLOGY			
Course Code	21EE8X79	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Eligible Students: For all engineering stream except E&E Engineering

Course Learning Objectives:

1. To Understand the fundamental laws and vehicle mechanics.
2. To Understand working of Electric Vehicles and recent trends.
3. Ability to analyze different power converter topology used for electric vehicle application.
4. Ability to develop the electric propulsion unit and its control for application of electric vehicles.

UNIT – I

Vehicle Mechanics: Roadway Fundamentals, Laws of Motion, Vehicle Kinetics, Dynamics of Vehicle Motion, Propulsion Power, Force-Velocity Characteristics, Maximum Gradability, Velocity and Acceleration, Constant FTR, Level Road, Velocity Profile, Distance Traversed, Tractive Power, Energy Required, Nonconstant FTR, General Acceleration, Propulsion System Design.

Electric and Hybrid Electric Vehicles: Configuration of Electric Vehicles, Performance of Electric Vehicles, Traction motor characteristics, Tractive effort and Transmission requirement, Vehicle performance, Tractive effort in normal driving, Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains. **14 Hours**

UNIT – II

Energy storage for EV and HEV: Energy storage requirements, Battery parameters, Types of Batteries, Modelling of Battery, Fuel Cell basic principle and operation, Types of Fuel Cells, PEMFC and its operation, Modelling of PEMFC, Super capacitors.

Electric Propulsion:

EV consideration, DC motor drives and speed control, Induction motor drives, Permanent Magnet Motor Drives, Switch Reluctance Motor Drive for Electric Vehicles, Configuration and control of Drives. **16 Hours**

UNIT – III

Design of Electric and Hybrid Electric Vehicles: Series Hybrid Electric Drive Train Design: Operating patterns, control strategies, Sizing of major components, power rating of traction motor, power rating of engine/generator, design of PPS Parallel Hybrid Electric Drive Train Design: Control strategies of parallel hybrid drive train, design of engine power capacity, design of electric motor drive capacity, transmission design, energy storage design.

9 Hours

Course Outcomes:

At the end of the course student will be able to

1. Explain the roadway fundamentals, laws of motion, vehicle mechanics and propulsion system design.
2. Explain the working of electric vehicles and hybrid electric vehicles in recent trends.
3. Model batteries, Fuel cells, PEMFC and super capacitors.
4. Analyze DC and AC drive topologies used for electric vehicle application.
5. Develop the electric propulsion unit and its control for application of electric vehicles.

Course Outcomes Mapping with Program Outcomes & PSO												
Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12
↓ Course Outcomes												
21EE8X .1	2	3										
21EE 8X .2	1	2	3									
21EE 8X .3	1	2	3									
21EE 8X .4	1	2	3									
21EE 8X .5	1	2	2									

1: Low 2: Medium 3: High

SEE QUESTION PAPER PATTERN:

- There will be **8** questions of **21** marks each in the question paper categorized into **3 Units** as per the syllabi & contact hours. The student will have to answer **5** full questions, selecting **2** full questions each from **Unit – I & Unit – II** and **1** full question from **Unit – III**.

TEXTBOOKS:

- Electric and Hybrid Vehicles: Design Fundamentals, Iqbal Husain, CRC Press, 2103
- Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, M. Ehsani, Y. Gao, S.Gay and Ali Emadi, CRC Press, 2105

REFERENCE BOOKS:

- Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles, Sheldon S. Williamson, Springer, 2113.
- Modern Electric Vehicle Technology, C.C. Chan and K.T. Chau, OXFORD University, 2101
- Hybrid Electric Vehicles Principles And Applications With Practical Perspectives, Chris Mi, M. Abul Masrur, David Wenzhong Gao, Wiley Publication, 2101

E-Books / MOOC:

- Introduction to Mechanics | Coursera
- NPTEL: Electrical Engineering - Introduction to Hybrid and Electric Vehicles
- Electric Vehicles - Part 1 - Course (nptel.ac.in)
- Hybrid Vehicles (edX) | MOOC List (mooc-list.com)
- NPTEL: Electrical Engineering - Introduction to Hybrid and Electric Vehicles
- Electric Cars: Technology | My MOOC (my-mooc.com)

NATIONAL CADET CORPS: ORGANIZATION, FUNCTIONS AND CAPABILITIES			
Course Code	21HU8X81	Course Type	OEC
Teaching Hours/Week (L:T:P:S)	3:0:0:0	Credits	03
Total Teaching Hours	39+0+0	CIE + SEE Marks	50+50
Teaching Department: Chemistry			
Course Learning Objectives:			
1.	To create evolved youth, who will be equipped to contribute in the development of the nation.		
2.	To train students so as to achieve their physical and mental endurance. To acquire body language of a smart soldier and to inculcate the sense of authority by commanding the troop under him/her.		
3.	To inculcate spirit of adventure, undertake adventure activities, to hone leadership qualities and risk-taking abilities.		
4.	To understand and develop life skills, soft skills and to improve the emotional quotient of the student.		
5.	To impart basic military training, to develop awareness about the defense forces and expose learners to military ethos / values		
UNIT – I			
NCC: Aims, Objectives and Organization NCC General, Aims, Objectives and Organization of NCC. Duties of NCC Cadets, NCC Camps: Types and Conduct. National Integration: Importance and Necessity, Unity in Diversity.			7
Personality Development Self-Awareness, Empathy, Critical and Creative Thinking, Decision Making and Problem Solving. Communication Skills, Coping with stress and emotions. Leadership: Traits, Indicators, motivation, moral values, Honor Code. Social Service and Community Development.			7
UNIT – II			
Naval Communication and Seamanship Naval Communication: Introduction, Semaphore, Navigation: Navigation of Ships- Basic requirements, Chart work. Seamanship: Introduction to Anchor work, Rigging Capsule, Boat work- Parts of Boat, Boat pulling instructions, Whaler sailing instructions. Ship Modeling.			8
Disaster management and environmental awareness Disaster Management- Organization, Types of Disasters, Essential Services, Assistance, Civil Defence organization. Adventure Activities. Dos and Don’ts, Fire services and Firefighting, Environmental Awareness and Conservation.			8
UNIT – III			
Naval Orientation Naval Orientation- Armed Forces and Navy Capsule, EEZ Maritime Security & ICG. Border & Coastal Areas: Security setup and Boarder/Coastal management in the area. Naval Orientation: Modes of Entry- IN, ICG, Merchant Navy. Border and Coastal areas: Security Challenges & role of cadets in Border management			9

Course Outcomes: At the end of the course student will be able to

1.	Display sense of patriotism, secular values and shall be transformed into motivated youth who will contribute towards nation building through national unity and social cohesion.
2.	Demonstrate the sense of discipline, improve bearing, smartness, turnout and develop the quality of immediate and implicit obedience of orders, with good reflexes.
3.	Acquaint, expose & provide knowledge about Army/Navy/ Air force and acquire information about expanse of Armed Forces, service subjects and important battles.

Course Outcomes Mapping with Program Outcomes & PSO

Program Outcomes→	1	2	3	4	5	6	7	8	9	10	11	12	PSO↓	
↓ Course Outcomes													1	2
HU1505-1.1						3	3	1						
HU1505-1.2						3	3							
HU1505-1.3									1					

1: Low 2: Medium 3: High

REFERENCE BOOKS:

1.	Cadets Handbook, R.K. Gupta, Ramesh Publishing House, New Delhi.
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FUNDAMENTALS OF IMAGE PROCESSING – A PRACTICAL APPROACH			
Course Code	21EC8X82	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:0:1	SEE Marks	50
Total Hours	26:0:26	Credits	03

Course Learning Objectives:

This course will enable the students to

1. Understand basic operations on images.
2. Understand the concepts of colour models.
3. Explain image enhancement techniques.
4. Perform morphological operations on images.
5. Perform thresholding operation for image segmentation.

Software Tool Required: MATLAB

Image Fundamentals: Description of Image and Basic operations: Image Brightening, Darkening, Addition, Subtraction, Multiplication and logic operations, Binary and Gray scale images, Color Fundamentals.

Image Enhancement Techniques: Concept & Importance of Histogram, Basic gray level transformations, Histogram processing, Basics of spatial filtering, smoothing spatial filters, sharpening filters.

Morphological Operations and Thresholding: Introduction, Erosion and Dilation, Opening and Closing, Thresholding, segmentation methods.

26 Hours

List of Experiments:

1. Introduction to MATLAB.
2. Reading and analyzing images.
3. Image Conversions.
4. Basic operations on images.
5. Basic Arithmetic operations on images- Addition, Subtraction and Multiplication.

6. Exploring Image manipulation operations.
7. Histogram processing.
8. Demonstration of Effects of Filters on images-Smoothing.
9. Demonstration of Effects of Filters on images-Sharpening.
10. Exploring different color models.
11. Demonstration of Morphological Operations.
12. Demonstration of thresholding operations.
13. Exploring image segmentation methods.

Scheme of SEE

Laboratory based evaluation

Course Outcomes:

At the end of the course the student will be able to

1. Demonstrate the understanding of basic operations on images
2. Apply image enhancement methods
3. Perform segmentation operation

Mapping of PO's/ PSO's & CO's:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	3	-	-	1	1	1	1	-	-	-	-
CO2	3	-	-	-	3	-	-	1	1	1	1	-	-	-	-
CO3	3	-	-	-	3	-	-	1	1	1	1	-	-	-	-
	3 – High				2 – Medium				1 - Low						

TEXTBOOKS:

1. R. C. Gonzalez and R. E Woods, “**Digital Image Processing**”, Pearson education (Asia)/Prentice Hall of India, 3rd Edition, 2109.
2. R. C. Gonzalez and R. E Woods, “**Digital Image Processing Using MATLAB**”, Pearson education (Asia)/Prentice Hall of India, 2nd Edition, 2111.
3. I.S. Jayaraman, S Esskairajan “**Digital Image Processing**”, illustrated, Tata McGraw-Hill Education, 2111.

NPTEL/ MOOC Link:

1. <https://nptel.ac.in/courses/117105135/>
2. <https://nptel.ac.in/courses/117105079>

INTRODUCTION TO YAKSHAGANA			
Course Code	21HU8X86	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning objectives:

The course will enable the students to:

1. Gain basic understanding of Thenku Thittu Yakshagana.
2. Perform basic movements.
3. Understand speech/dialogue, rhythm, Entry and improvisation skills.

UNIT – I

Introduction: Meaning and features, Origin and development, Difference between Thenkuthittu and Badaguthittu yakshagana. A brief introduction to Thenkuthittu Yakshagana. Thalasa-Aadi thala, yeka thala, Kore thala and Asta Thala with biditha and mukthya- Practice. Dhingina – Practice.....

14 Hours

UNIT – II

Thalasa- Rupaka Thala, Trivide Thala, Jampe thala etc. with biditha and mukthaya. Dhigina – Practice Rangasthala Pravesha steps and Eripada ettugade steps. Revision of all Thalasa.

14 Hours

UNIT – III

Yakshagana Prasanga Practice- Abhinaya and presentation.....

11 Hours

Performance: The final part of the course is the performance. A Prasanga will be chosen and taught to the participants and they will perform the same in front of a live audience.

REFERENCE BOOKS:

1. Arthayana: Yakshagana Talamaddale Arthagarike: Ondu Vishleshane: Dr.Ramananda Banari.
2. Yaksha Naatyanjali Thenkuthittu- Sampadaka: Sathish Madivala, Karkala.
3. Yakshagna Shikshana Patya Pustka- Prathamika vibhaga (Karnatka Patya pusthaka sangha- Bengaluru)
4. Koralara: YakshaganaVimarsha Sankalana: Dr.M. Prabhakara Joshi
5. Vaagartha Gawrava: (Dr. Joshi Abhinandana Guchaha): Ga. Na. Bhat

MARKETING MANAGEMENT			
Course Code	21ME8X88	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Hours	39	Credits	03

Course Learning Objectives:

This Course will enable students to

1. Understand and learn the marketing concepts and their application to profit-oriented and non-profit oriented organizations.
2. Able to apply the marketing concepts to analyze the buying behavior & marketing segments to solve these problems.
3. Understand and learn the need for a customer orientation in product pricing & marketing research in the competitive global business environment;
4. Able to develop an understanding and acquiring skills in how to successfully design and implement marketing plans and strategies.
5. Understand and learn the concept of sales, advertising & distribution of marketing mix and its application in traditional and novel environments characterized by emerging information technologies.

UNIT - I

BASICS

Definition, Marketing Process, Dynamics, Needs, Wants & Demands, Marketing Concepts, Environment, mix, types, philosophies, Selling Vs. Marketing, organization, Industrial Vs. Consumer Marketing, Consumer goods, Industrial goods, Product hierarchy.

8 Hours

BUYING BEHAVIOUR & MARKET SEGMENTATION

Cultural, Demographic factors, Motives, types, Buying decisions, segmentation factors, Demographic, Psychographic & Geographic Segmentation, Process, Patterns.

8 Hours

UNIT - II

PRODUCT PRICING & MARKETING RESEARCH

Objectives, pricing, Decisions and Pricing methods, Pricing Management. Introduction, Uses, process of Marketing Research.

8 Hours

MARKETING PLANNING & STRATEGY FORMULATION

Components of a marketing plan, strategy formulations and the marketing process, implementation, Portfolio analysis, BCG, GEC grids.

8 Hours

UNIT - III

ADVERTISING, SALES PROMOTION & DISTRIBUTION

Characteristics, Impact, goals, types, Sales promotion-Point of Purchase, Unique Selling proposition. Characteristics, Wholesaling, Retailing, channel design, logistics, Modern Trends in retailing.

7 Hours

Course Outcomes (CO):**At the end of the course the student will be able to**

CO1	Explain the basic marketing concepts
CO2	Interpret the buying behaviour of customers and role of marketing segments
CO3	Explain the role of product pricing and marketing research in the competitive global business environment
CO4	Analyse the marketing plans and strategies.
CO5	Explain the role of sales, advertising and distribution in marketing to achieve the goals of marketing

TEXTBOOK:

1. Govindarajan. M. 'Modern Marketing Management', Narosa Publishing House, New Delhi, 1999

REFERENCE BOOKS:

1. Philip Kotler, "Marketing Management: Analysis, Planning, Implementation and Control", 1998.
2. Green Paul.E. and Donald Tull, "Research for Marketing Decisions", 1975.
3. Ramaswamy.V.S. and S.Namakumari, "Marketing Environment: Planning, Implementation and Control the Indian Context", 1990
4. Jean Plerre Jannet Hubert D Hennessey Global Marketing Strategies.

WHEELED MOBILE ROBOTS			
Course Code	21RI8X92	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	(3:0:0:0)	SEE Marks	50
Total Hours of Pedagogy	39	Total Marks	100
Credits	03	Exam Hours	3
<u>Course Learning Objectives:</u> This Course will enable students to: <ul style="list-style-type: none"> • Understand the fundamental concepts and applications of mobile robotics • Present the fundamental analytical concepts required for the study of mobile robot kinematics • Learn mathematical models and computational and motion control methods applicable to wheeled mobile robotic systems • Understand basic sensor systems related to state measurements, navigation and localization. • Learn different motion planning and navigation schemes related to mobile robots 			
UNIT - I			
Introduction: Introduction to mobile robots and mobile manipulators. Components of a mobile robot. Types of mobile robots. Locomotion: Introduction, Key issues for locomotion, Types of land-based mobile robots, wheeled locomotion case studies. Mobile Robot Kinematics: Introduction, Need of mathematical model, degree of freedom. Differential Kinematics: Representing robot position, forward differential kinematics, Inverse differential kinematics, Degree of manoeuvrability, Types of wheels for mobile robots. Kinematic simulation of a mobile robot. A generalized			

wheel model, Examples: Differential wheel drive mobile robot, Skid steering wheel drive mobile robot, Omni wheel drive mobile robot, Mecanum wheel drive mobile robot, Tricycle wheel drive mobile robot. Types of Mobile Robots based on Wheel configuration: Holonomic and non-holonomic systems, kinematic model, Pseudo Inverse. 15 Hours	
Pedagogy	Chalk and talk, Power point presentation,
UNIT - II	
Kinematic Simulation of Wheeled Mobile Robots: Kinematic Model, Wheel Model, Differential wheel drive, Omni-directional wheel drive, Mecanum wheel drive. Perception: Sensors for Mobile Robots, Sensor classification, characterizing sensor performance, Wheel/motor sensors, Heading sensors, Ground-based beacons, Active ranging, Motion/speed sensors, Vision-based sensors Mobile Robots –Localisation and Mapping: Autonomy for Robots, Building Blocks of Navigation, Challenges of Localization, Noise and Aliasing, Mobile robot localisation: Odometry, Dead reckoning, Map based localisation, Markov Localisation, Kalman Filter. Autonomous map building: SLAM. 15 Hours	
Pedagogy	Chalk and talk, Power point presentation,
UNIT – III	
Mobile Robot Navigation: Competences for Navigation, Path Planning Methods, Graph Construction: Visibility graph, Voronoi diagram, Cell decomposition methods. Graph Search Methods and Algorithms: Deterministic Graph Search, Breadth-first search, Depth-first search, Grass fire, Dijkstra’s algorithm. Path Planning- A* Algorithm and Potential Field methods. Obstacle Avoidance: Bug Algorithm. 09 Hours	
List of Experiments:	
<ul style="list-style-type: none"> • Kinematic simulation of a land based mobile robot using a MATLAB script along with Euler method • Kinematic simulation and motion animation of a land based mobile robot using MATLAB • Kinematic simulation of an Omni directional wheel drive mobile robot using MATLAB • Kinematic simulation of a Mecanum wheel drive mobile robot using MATLAB • Control of Mobile Robots using ESP 32 	
Course outcome (Course Skill Set) At the end of the course student will be able to <ol style="list-style-type: none"> 1. Acquire knowledge about the fundamental concepts and applications of mobile robots 2. Build kinematic models of holonomic and nonholonomic mobile robots 3. Apply mathematical models and computational and motion control methods applicable to mobile robotic systems 4. Apply Localization and Mapping techniques for wheeled mobile robot control 5. Apply algorithms and methodologies for wheeled mobile robot navigation and path planning. 	
Suggested Learning Resources: Books: <ol style="list-style-type: none"> 1. R Siegwart, IR Nourbakhsh, D Scaramuzza, Introduction to Autonomous Mobile Robots, MIT Press, USA, 2011. 2. SG Tzafestas, Introduction to Mobile Robot Control, Elsevier, USA, 2014. 3. A Kelly, Mobile Robotics: Mathematics, Models, and Methods, Cambridge University Press, USA, 2013. 4. S Thrun, W Burgard, D Fox, Probabilistic Robotics, MIT Press, USA, 2005. 5. G Dudek, M Jenkin, Computational Principles of Mobile Robotics, Cambridge University Press, USA, 2010. 	
Web links and Video Lectures (e-Resources): <ol style="list-style-type: none"> 1. https://onlinecourses.nptel.ac.in/noc22_me38/preview 	

OPERATIONS RESEARCH				
Course Code:		21ME8X93	Course Type:	OEC
Teaching Hours/Week (L: T: P: S):		3:0:0:0	Credits:	03
Total Teaching Hours:		40+0+0	CIE + SEE Marks:	50+50
Teaching Department: Mechanical Engineering				
Course Learning Objectives:				
1.	Describe the scope and limitations of OR methods and outline the role of OR techniques in supporting the decisions. Understand, formulate, and solve Linear programming problems and sequencing problems.			
2.	Solve a Linear Programming Problem using Simplex Method and its allied methods. Apply Johnson’s algorithm to solve sequencing problem.			
3.	Formulate and solve balanced and unbalanced transportation problems.			
4.	Formulate and solve assignment problems using Hungarian method .			
5.	Construct networks and estimate project duration using PERT and CPM.			
UNIT - I				
INTRODUCTION				01 Hour
Introduction to OR, nature and meaning, applications, modeling in OR, phases of OR study.				
LINEAR PROGRAMMING				10 Hours
Introduction to Linear Programming through an example, graphical method, formulation of LP model from practical problems, assumptions and properties of linear programming, simplex method, Big M method, 2 phase method, Duality theory, Primal and dual relationship.				
SEQUENCING				4 Hours
Johnson's algorithm, n - jobs to 2 machines, n jobs 3 machines, n jobs m machines without passing sequence. 2 jobs n machines with passing. Graphical solutions, priority rules.				
UNIT - II				
TRANSPORATION PROBLEMS				08 Hours
Formulation of transportation problem, methods to find initial feasible solution using North-West Corner rule, Vogel's Approximation Method, optimality in TP by Modified Distribution (MODI) method, unbalanced TP, maximization, degeneracy, and applications.				
ASSIGNMENT PROBLEMS				07 Hours
Mathematical formulation of an assignment problem, Hungarian method for optimal solution, unbalanced assignment problem, Travelling Salesman Problem (TSP).				
UNIT - III				
PROJECT MANAGEMENT USING NETWORK ANALYSIS				10 Hours
Network construction, determining critical path, floats, scheduling by network, project duration, crashing of networks. PERT - Estimation of project duration, variance under probabilistic models, prediction of date completion.				

Course Outcomes: At the end of the course student will be able to														
1.	Discuss about the use and applications of Operations Research in solving problems, formulate and solve linear programming problems using different methods.													
2.	Apply sequencing algorithm to solve different category of problems.													
3.	Solve transportation problems using MODI method adopting different methods to find the initial basic feasible solutions considering aspects like unbalance and degeneracy.													
4.	Formulate assignment problems and solve it by Hungarian method to find the optimal solutions. Apply Traveling Salesman method to solve problems.													
5.	Construct project network, determine critical path by critical path method, calculate different types of floats. Estimate project duration using PERT.													
Course Outcomes Mapping with Program Outcomes & PSO														

NEXT GENERATION WIRELESS NETWORKS			
Course Code	21CC8X94	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	39	Exam Hours	03
Credits – 3			
UNIT - I			Contact Hours
Historical Trend for Wireless Communication- Mobile Communications Generations: 1G to 4G – Evolution of LTE Technology to Beyond 4G – Pillars of 5G – Standardization Activities –Use cases and Requirements – System Concept 5G Architecture: Software Defined Networking – Network Function Virtualization – Basics about RAN Architecture –High-Level Requirements for 5G Architecture – Functional Architecture and 5G Flexibility – Physical Architecture and 5G Deployment.			15
UNIT - II			
Massive Multiple-Input Multiple –Output Systems : MIMO in LTE – Single-user MIMO – Multi-user MIMO – Capacity of Massive MIMO – Pilot Design of Massive MIMO.			15

D2D Communications: from 4G to 5G – Radio Resource Management for Mobile Broadband D2D – Multi-hop D2D Communications for Proximity and Emergency Services – Multi-operator D2D Communication.	
UNIT – III	
Wi-Fi 6 Protocol and Network: Introduction Wi-Fi Generations 1 to 5 Overview Wi-Fi Generation 6 (802.11ax) Wi-Fi 6 and 5G 60 GHz Wi-Fi , Introduction to 6G and Networks	9
Course Outcomes: Upon completion of this course, students will be able to: 1. Describe and explain the evolution of 5G, system concepts and spectrum challenges 2. Illustrate and explain the 5G functional and physical architecture and its requirements 3. Illustrate and explain the fundamentals, resource allocation and transceiver algorithms for Massive MIMO 4. Describe and explain the requirements and fundamental techniques for D2D Communication 5. Understand, Implement, explain the Wi-Fi 6 Protocol and Network	
TEXTBOOKS: <ul style="list-style-type: none"> Asif Oseiran, JoseF. Monserrat and Patrick Marsch, “5G Mobile and Wireless Communications Technology,” Cambridge University Press, 2016 Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks,” Wiley, 2015 Sundar Gandhi Sankaran, Susinder Rajan Gulasekaran, Wi-Fi 6 Protocol and Network, Artech House, 2021	
REFERENCE BOOK: <ul style="list-style-type: none"> Patrick Marsch, Omer Bulakci, Olav Queseth and Mauro Boldi, “5G System Design – Architectural and Functional Considerations and Long Term Research”, Wiley, 2018 	

INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING			
Course Code	21AI8X95	CIE Marks	50
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03
Credits – 3			
Course Learning Objectives: This Course will enable students to: <ol style="list-style-type: none"> Understand the history of AI and machine learning. Learn principles and algorithms of supervised learning. Explain various applications of Techniques in association analysis. Use different unsupervised learning techniques to solve the problem specification. Understand the methods of parametric and non-parametric methods on real time data analysis and combined learners. 			
UNIT – I			Hours
Introduction to AI: what is AI, Acting Humanly: The Turing Test approach, Thinking Humanly: The cognitive modelling approach, thinking rationally: The laws of thought approach, Acting Rationally: The rational agent approach. The state of art			15

<p>Branches Of Artificial Intelligence: Machine Learning, Deep Learning, Natural Language Processing, Robotics, Expert Systems, Fuzzy Logic.</p> <p>Intelligent Agents: Agents and Environments, Good behavior: The concept of rationality, The nature of environments, properties of task environments, Structure of Agents: Agent Programs, Types of agent programs.</p> <p>Solving Problems by Searching: Problem solving Agents, well defined problems and solutions, formulating problems, Example problems: Toy problems: Vacuum world, 8-Queen's problem, Real world problem: Airline Route finding problem</p> <p>Textbook 1: Chapter 1, 2, 3</p> <p>Foundations of Machine Learning</p> <p>What is machine learning? Applications of Machine learning, Understand Data. Types of machine learning: Supervised, Unsupervised, Reinforcement Learning.</p> <p>Supervised Learning:</p> <p>Linear Regression: Introduction, univariate linear regression, multivariate linear regression, regularized regression, Logistic regression, Support Vector Machines.</p> <p>Artificial Neural Networks.</p> <p>Textbook: Chapter 1, 2.</p> <p>Classification: Preliminaries; General approach to solving a classification problem; Confusion Matrix, Decision tree induction, how decision tree works, Hunt's algorithm, Design issues, Methods for expressing attribute test conditions, Measures for selecting best fit, Algorithm for decision tree induction; Rule-based classifier: How rule-based classifier works, Rule ordering schemes, Nearest-neighbor classifier: Selecting K value, KNN algorithm.</p> <p>Textbook 3: Chapter 4, 5</p> <p>Tutorials:</p> <ol style="list-style-type: none"> 1. Handling the missing values using orange tool. 2. Visualize: Scatter Plot (for univariate), Scatter Plot Matrix (for multivariate) using orange tool. 3. iris classification using different algorithm. 	
UNIT - II	
<p>Unsupervised Learning:</p> <p>Association Analysis-1: Problem definition, Frequent item set generation, Apriori principle, Candidate generation and pruning, Rule Generation in Apriori algorithm.</p> <p>Association Analysis – 2: FP-Growth algorithm, Evaluation of association patterns, Effect of skewed support distribution, Sequential patterns.</p> <p>Cluster Analysis: Different types of clustering: Hierarchical vs partitional, Exclusive vs overlapping, Fuzzy clustering, Complete vs partial. Types of clusters: Well separated, Prototype based clusters, Graph based clusters, Density based clusters, Conceptual clusters, K-means clustering algorithm, centroids and objective functions, Choosing initial centroids, time space complexity of K-means, K-means additional issues, Strengths and weakness of k-means, Agglomerative hierarchical clustering, Key issues in hierarchical clustering, Strengths and weaknesses, DBSCAN algorithm.</p> <p>Textbook 3: Chapter 6, 7, 8, 9.</p> <p>Tutorials:</p> <ol style="list-style-type: none"> 1. Diabetes classification using orange tool. 2. Association analysis using orange tool. 3. Trying different evaluation matrix using orange tool. 	15
UNIT – III	
<p>Parametric Methods: Introduction, Maximum Likelihood Estimation, Bernoulli Density, Multinomial Density, Gaussian (Normal) Density, Evaluating an Estimator: Bias and Variance, The Bayes' Estimator, Parametric Classification</p> <p>Nonparametric Methods: Introduction, Nonparametric Density Estimation, Histogram Estimator, Kernel Estimator, k-Nearest Neighbor Estimator, Generalization to Multivariate Data, Nonparametric Classification, Condensed Nearest Neighbor.</p> <p>Textbook 2: Chapter 4, 8.</p>	10

<p><u>Course Outcomes:</u></p> <p>Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Basics of AI, branches of AI and ML. 2. Develop an appreciation for what is involved in learning models from supervised learning and algorithms on classification. 3. Apply association analysis on structured data. 4. Apply different unsupervised learning techniques to solve the problem specification. 5. Interpret methods of parametric and non-parametric methods on real time data analysis and know the combined learning. 	
<p>TEXTBOOKS:</p> <ol style="list-style-type: none"> 1. Stuart Russel and Peter Norvig, “Artificial Intelligence A Modern Approach”, Pearson 3rd Edition, 2016. 2. Introduction to Data Mining-Pang-NingTan, Michael Steinbach,Vipin Kumar, Pearson Education, 2009. 3. Ethem Alpaydin, Introduction to Machine Learning, Second Edition, 2004. 	
<p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. T. M. Mitchell, “Machine Learning”, McGraw Hill, 1997. 2. R. O. Duda, P. E. Hart and D. G. Stork Pattern Classification, Wiley Publications, 2001 3. T. Hastie, R. Tibshirani, J. Friedman. The Elements of Statistical Learning, 2e, 2008. 4. P. Flach, “Machine Learning: The art and science of algorithms that make sense of data”, Cambridge University Press, 2012. 5. K. P. Murphy, “Machine Learning: A probabilistic perspective”, MIT Press, 2012. 6. M. Mohri, A. Rostamizadeh, and A. Talwalkar, “Foundations of Machine Learning”, MIT Press, 2012. 7. S. Russel and P. Norvig, “Artificial Intelligence: A Modern Approach”, Third Edition, Prentice Hall, 2009. 	