

Semester: V		
TECHNICAL MANAGEMENT & ENTREPRENEURSHIP (Theory)		
Course Code: MVJ21IO51		CIE Marks: 50
Credits: L:T:P: 3:0:0		SEE Marks: 50
Hours: 40L		SEE Duration: 3 Hrs.
Course Learning Objectives: The students will be able to		
1	Study the concepts of management, planning, organizing, and staffing.	
2	Acquire the knowledge required to become an entrepreneur.	
3	Understand and choose the appropriate institutional support to succeed as an entrepreneur.	
4	Study the requirements towards the small-scale industries and project preparation.	
5	Understand the general principles of IPR, Concept and Theories, Criticisms of Intellectual Property Rights.	

UNIT-I	
<p><i>Prerequisites: Basics of management system, roles and responsibilities.</i></p> <p>Management: Introduction, Meaning, nature and characteristics of Management, Scope and Functional areas of management, Management as a science, art of profession, Management & Administration, Roles of Management, Levels of Management, Managerial Skills, Management & Administration, Development of Management Thought early management approaches, Modern management approaches.</p> <p>Planning: Nature, Importance, Types, Steps and Limitations of Planning,</p> <p>Decision Making: Meaning, Types and Steps in Decision Making</p> <p>Laboratory session/Experiment:</p> <ol style="list-style-type: none"> 1. Choose, Conduct & document a survey on the Management structure of an organization. <p>Applications: IT sectors and Institutional Research sectors.</p> <p>Video link / Additional online information:</p> <ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/110/107/110107150/ https://nptel.ac.in/courses/110/105/110105146/ 	8 Hrs
UNIT-II	

<p>Organizing and Staffing: Nature and purpose of organization, Principles of organization, Span of Management, Types of organization, Departmentation Committees, Centralization Vs Decentralization of authority and responsibility, Span of control, MBO and MBE (Meaning Only) Nature and importance of staffing: Need and Importance, Recruitment and Selection Process.</p> <p>Directing and Controlling: Meaning and nature of directing Leadership styles, Motivation Theories, Communication: Meaning and importance, Leadership: Meaning, Characteristics, Behavioral Approach of Leadership; Coordination: Meaning, importance and Techniques of Coordination. Meaning and steps in Controlling, Essentials of a sound control system and Methods of establishing control system.</p> <p>Laboratory session/Experiment:</p> <ol style="list-style-type: none"> 1. Document the job responsibilities of a manager level employee of an organization. <p>Applications: IT sectors, Banking sectors and Institutional Research sectors.</p> <p>Video link / Additional online information: https://nptel.ac.in/courses/110/107/110107151/</p>	<p>8 Hrs</p>
<p>UNIT-III</p>	
<p>Entrepreneur: Meaning of Entrepreneur, Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneurs, Entrepreneur - an emerging. Classification of Entrepreneurs, Concept of Entrepreneurship, Evolution of Entrepreneurship, Development of Entrepreneurship, Stages in entrepreneurial process, Role of Entrepreneurs in Economic Development, Entrepreneurship in India, Entrepreneurship- its Barriers.</p> <p>Laboratory session/Experiment:</p> <ol style="list-style-type: none"> 1. Find, Fill and Document the application forms which are all need to start an enterprise. <p>Applications: Core Industrial sectors, New Enterprises sectors.</p>	<p>8 Hrs</p>

<p>Video link / Additional online information: https://nptel.ac.in/courses/110/106/110106141/</p>	
UNIT-IV	
<p>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, Different Policies of SSI, Government Support for SSI during 5year plans. Impact of Liberalization, Privatization, Globalization on SSI Effect of WTO/GATT, Sickness in SSI sector, Problems for Small Scale Industries, Supporting Agencies of Government for SSI, Meaning, Nature of support, Objectives, Functions, Types of Help, Ancillary Industry and Tiny Industry.</p> <p>Laboratory session/Experiment:</p> <ol style="list-style-type: none"> 1. Find, Fill and Document the application forms which are all need to start a small-scale industry. <p>Applications: Industrial sectors, and Institutional Research sectors.</p> <p>Video link / Additional online information:</p> <ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=2I0XdF_uOuA https://www.youtube.com/watch?v=jmx7SiCzay8 	8 Hrs
UNIT-V	
<p>Intellectual Property Rights: Introduction to Intellectual Property Rights, Copyrights, Trademarks, Designs and Design Patents, Semiconductor Integrated Circuits and Layout Designs. Ideas and Intellectual Property Rights, Contents of a Patent, Patent Draft, Filing Patent Applications, IPR Strategy and IPR Policy</p> <p>Laboratory session/Experiment:</p> <ol style="list-style-type: none"> 1. Conduct a survey on Forms and Fees related to IPR. Document the application forms for the Grant of Patent. https://www.ipindia.gov.in/form-and-fees.htm <p>Applications: Research works copyrights, Paper Publication and Patent filing.</p> <p>Video link / Additional online information:</p>	8 Hrs

1. https://www.youtube.com/watch?v=RLQivEQUgUc	
https://www.youtube.com/watch?v=NFTBbfYGM6A	

Course Outcomes: After completing the course, the students will be able to	
CO1	Explain about the management and planning.
CO2	Apply the knowledge on organizing, staffing, directing, and controlling.
CO3	Analyse the concept of Entrepreneurship.
CO4	Choose the requirements towards the small-scale industries and project preparation.
CO5	Understand the Concepts of Intellectual Property Rights

Text Books:	
1.	P.C.Tripathi, P.N.Reddy , "Principles of Management", Tata Mc Graw Hill, 5 th edition, 2008.
2.	Poornima M Charantimath, "Entrepreneurship Development Small Business Enterprises", Pearson Education, 2008, ISBN 978-81-7758-260-4.
3.	Rachna Singh Puri & Arvind Viswanathan, "Practical Approach to Intellectual Property Rights", 1/e, I K International Publishing House Pvt. Ltd, 2009.
Reference Books:	
1.	Vasant Desai, "Dynamics of Entrepreneurial Development & Management", Himalaya Publishing House, 6th Edition, 2018.
2.	Stephen P Robbins, "Management", Pearson Education/PHI1, 7 th Edition, 2003.
3.	Roberts Lusier Thomson, "Management Fundamentals - Concepts, Application, Skill Development", Fifth Edition, Thomson Publications, 2011.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks

obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom’s taxonomy level.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	3	-	-	1	-	3	3	2	2	1
CO2	-	3	3	-	-	1	-	3	3	2	2	1
CO3	-	3	3	-	-	1	-	3	3	2	2	1
CO4	-	3	3	-	-	1	-	3	3	2	2	1
CO5	-	3	3	-	-	1	-	3	3	2	2	1

High-3, Medium-2, Low-1

Semester: V		
Data Base Management System (Theory)		
Course Code: MVJ21IO52		CIE Marks: 50
Credits: L:T:P: 3:0:0		SEE Marks: 50
Hours: 40L		SEE Duration: 3 Hrs.
Course Learning Objectives: The students will be able to		
1	Provide a strong foundation in database concepts, technology, and practice.	
2	Practice SQL programming through a variety of database problems.	
3	Demonstrate the use of concurrency and transactions in database.	
4	Design and build database applications for real world problems.	

UNIT-I	
<p>Introduction to Databases: Introduction; An example; characteristics of the database approach; actors on the scene; workers behind the scene; advantages of using the DBMS approach; A brief history of database Applications; when Not to use a DBMS.</p> <p>Overview of Database Languages and Architectures: Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment.</p> <p>Modelling using Entities and Relationships: Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, examples.</p> <p>Laboratory Sessions/ Experimental learning: Draw ER diagram for database applications (logical database design).</p> <p>Applications: Library Management system, Banking, Universities and colleges, credit card transactions, social media sites, Telecommunications, Finance, Military, online shopping, Human Resource Management, Manufacturing, Airline Reservation systems.</p> <p>Video link / Additional online information (related to module if any):</p> <ul style="list-style-type: none"> https://nptel.ac.in/courses/106106093/ 	10 Hrs

<ul style="list-style-type: none"> • https://nptel.ac.in/courses/106105175/ • https://www.youtube.com/watch?v=WSNqcYqByFk 	
UNIT-II	
<p>Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, dealing with constraint violations.</p> <p>Relational Algebra: Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra.</p> <p>Mapping Conceptual Design into a Logical Design: Relational Database Design using ER-to-Relational mapping.</p> <p>SQL: SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL.</p> <p>Laboratory Sessions/ Experimental learning: programs to perform set operations, arithmetic operations, joins, selection, projection, create tables for real world db applications and insert values to it.</p> <p>Applications: RDBMS, enterprise level software solution (except light weight web applications)</p> <p>Video link / Additional online information (related to module if any):</p> <ul style="list-style-type: none"> • https://nptel.ac.in/courses/106106093/ • https://nptel.ac.in/courses/106105175/ • https://www.youtube.com/watch?v=gGGHjYbQMvw • https://www.youtube.com/watch?v=nc1yivH1Yac <p>https://www.youtube.com/watch?v=64szTfLNu3o</p>	10 Hrs
UNIT-III	
<p>SQL: Advances Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL, Schema change statements in SQL.</p>	10 Hrs

<p>Database Application Development: Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, Embedded SQL.</p> <p>Laboratory Sessions/ Experimental learning: Mini-projects to develop connections between front end and backend(database) using JDBC. Write SQL queries for the given schema.</p> <p>Applications: Java Programming, In Server to reduce network traffic and to provide security (Stored procedure)</p> <p>Video link / Additional online information (related to module if any):</p> <ul style="list-style-type: none"> • https://www.youtube.com/watch?v=64szTfLNu3o • https://www.digimat.in/nptel/courses/video/106105175/L11.html • https://www.youtube.com/watch?v=sjzlr0EsZL4 • https://nptel.ac.in/courses/106106093/ <p>https://nptel.ac.in/courses/106105175/</p>	
UNIT-IV	
<p>Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. Dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FD's, minimal covers.</p> <p>Laboratory Sessions/ Experimental learning: Draw schema diagram which satisfy all forms of normalization for all db real world application</p> <p>Applications: to optimize database design</p> <p>Video link / Additional online information (related to module if any):</p> <ul style="list-style-type: none"> • https://nptel.ac.in/courses/106106093/ • https://nptel.ac.in/courses/106105175/ <p>https://www.youtube.com/watch?v=YD8dhOmuVnY</p>	10 Hrs

UNIT-V

<p>Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL.</p> <p>Concurrency Control in Databases: Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering.</p> <p>File Organizations and Indexes: Introduction, Hashing techniques, Indexing, Structures for Files.</p> <p>Laboratory Sessions/ Experimental learning: Develop banking and other financial applications.</p> <p>Applications: systems that manage sales order entry, airline reservations, payroll, employee records, manufacturing, and shipping. Operating system(deadlock)</p> <p>Video link / Additional online information (related to module if any):</p> <ul style="list-style-type: none">• https://nptel.ac.in/courses/106106093/• https://nptel.ac.in/courses/106105175/ <p>https://www.youtube.com/watch?v=5amml5KU4mo</p>	10 Hrs
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Course Outcomes: After completing the course, the students will be able to	
CO1	Identify, analyse and define database objects, enforce integrity constraints on a database using RDBMS.
CO2	Use Structured Query Language (SQL) for database manipulation.
CO3	Design and build simple database systems.
CO4	Apply the concepts of Normalization and design database which possess no anomalies.
CO5	Develop application to interact with databases.

Text/Reference Books:	
1	Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson
2	Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill

3	Silberschatz Korth and Sudharshan, Database System Concepts, 6th Edition, McGrawHill, 2013.
4	Database Principles Fundamentals of Design, Implementation and Management Cengage Learning 2012.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom’s taxonomy level.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	3	2	3	-	-	-	1	-	-	2
CO2	3	3	3	2	2	-	-	-	1	-	-	2
CO3	3	3	3	2	2	-	-	-	1	-	-	2
CO4	2	3	3	2	2	-	-	-	1	-	-	2
CO5	2	3	3	3	3	-	-	-	2	-	-	2

SEMESTER:V		
PYTHON FOR IOT (THEORY AND PRACTICAL)		
Course Code: MVJ21IO53		CIE Marks:50+50
Credits: L:T:P: 3:0:2		SEE Marks: 50 +50
Hours:40 L+ 26 P		SEE Duration: 03+03 Hours
Course Learning Objectives: The students will be able to		
1	To know the basics of Python Programming and to read and write simple Python programs with expression and statements.	
2	To develop Python programs with conditionals and loops.	
3	To define Python functions and call the function.	
4	To implement Python Programming in Arduino.	
5	To Understand the Python programming for Data Science.	

UNIT-I	
<p><i>Prerequisite: Basic mathematical calculation skills and logical skills</i></p> <p>The Context of Software Development: Software, Development Tools, Learning Programming with Python, The Python Interactive Shell. Values and Variables, Integer and String Values, Variables and Assignment, Identifiers, Floating-point Numbers, Control Codes within Strings, User Input, Controlling the print, String , Multi-line Strings Writing a Python Program and a Longer Python program.</p> <p>Laboratory Sessions/ Experimental learning: Print "Python foundation for IIOT Engineering" by executing python programming.</p> <p>Applications: Printing of Results from the modules.</p> <p>Video link / Additional online information: https://pythonprogramming.net > introduction-learn-python-3-tutorials</p>	8 Hrs
UNIT-II	
<p>Expressions and Arithmetic: Expressions; Mixed Type Expressions; Operator Precedence and Associativity; Formatting Expressions; Errors; Syntax Errors; Run-time Exceptions; Logic Errors ; Arithmetic Operators;</p> <p>Conditional Execution: Boolean Expressions, Statements, Compound Boolean Expressions, Floating-point Equality, Nested Conditionals, Multi-way Versus Sequential Conditionals, Conditional Expressions, Errors, Logic Complexity</p>	8 Hrs

<p>Laboratory Sessions/ Experimental learning: Find the Greatest Number among “12345, 32145 and 23154” by executing python programming.</p> <p>Applications: Arithmetic / Conditional Operations</p> <p>Video link / Additional online information:</p> <ol style="list-style-type: none"> 1. https://www.coursera.org/lecture/interactive-python-1/arithmetic-expressions-rMvoA 	
UNIT-III	
<p>Iterations And Functions; Iteration: While Statement; Definite Loops vs Indefinite Loops; for Statement; Nested Loops; Abnormal Loop Termination; while/else and for/else; Infinite.</p> <p>Functions: Introduction to Using Functions; Functions and Modules ; Function Basics ; Types of Functions; Parameter Passing ; Documenting Functions and Custom Functions vs. Standard Functions Turtle Graphics ; Techniques for Importing Functions and Modules; Writing Functions.</p> <p>Laboratory Sessions/ Experimental learning: Compute Square Root, drawing a Tree, Printing Prime Numbers and Insisting on Proper Input by using Iterations.</p> <p>Applications: Iterative operations can be implemented</p> <p>Video link / Additional online information:</p> <ol style="list-style-type: none"> 1. https://www.codementor.io/@kaushikpal/user-defined-functions-in-python-8s7wyc8k2 	8 Hrs
UNIT-IV	
<p>Lists, Tuples, Dictionaries; Lists: list operations, slices, methods and parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods.</p> <p>Arduino with Python: Introduction to Arduino programming History; Why Arduino; Arduino variants; Comments; Variables; Constants; Data types; Conversions; Functions and statements; setup function; loop function; pin Mode function; Working with pins; Statements</p>	8 Hrs

<p>Laboratory Sessions/ Experimental learning: How to apply the Firmata Protocol and to connect the Arduino board for python programming execution.</p> <p>Applications: Implementation of modules in Aurdino board</p> <p>Video link / Additional online information :</p> <p>1. https://www.electronicshub.org/arduino-rf-transmitter-receiver-module/</p>	
UNIT-V	
<p>Data Science and Python: Considering the emergence of data science; Outlining the core competencies of a data scientist; Linking data science and big data ;Understanding the role of programming ; Creating the Data Science Pipeline ; Understanding Python’s Role in Data Science; Considering the shifting profile of data scientists; Working with a multipurpose, simple, and efficient language; Learning to Use Python Fast.</p> <p>Laboratory Sessions/ Experimental learning: How to Load, Train and View a simple model using python programming.</p> <p>Applications: Machine Learning Project in Python</p> <p>Video link / Additional online information:</p> <p>1. https://data-flair.training/blogs/train-test-set-in-python-ml/</p>	8 Hrs
LABORATORY EXPERIMENTS	
<ol style="list-style-type: none"> 1. Print all the Disarium numbers between 1 and 100. 2. Encrypt the text using Caesar Cipher technique. Display the encrypted text. Prompt the user for input and the shift pattern. 3. Perform Jump Search for a given key and report success or failure. Prompt the user to enter the key and a list of numbers. 4. The celebrity problem is the problem of finding the celebrity among n people. A celebrity is someone who does not know anyone (including themselves) but is known by everyone. Write a Python program to solve the celebrity problem. 5. Construct a linked list. Prompt the user for input. Remove any duplicate numbers from the linked list. 6. Traverse a path and display all the files and subdirectories in each level till the deepest level for a given path. Also, display the total number of files and subdirectories 7. How to create a menu drive with a dictionary for words and their meanings. How to add the Write functions to add a new entry (word: meaning), search for a particular word and retrieve meaning, given meaning find words with the same meaning, remove 	

<p>an entry, display all words sorted alphabetically.</p> <p>8. Identify a word with a sequence of one upper case letter followed by lower case letters.</p> <p>9. Plot the Line chart in MS Excel Sheet using Xlsx Writer module to display the annual net income of the companies.Design of Thickener</p>

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the Basics of Python Programming
CO2	Implement the expression, conditional executions in Python flow.
CO3	Understand the iterations and functions in Python Programming.
CO4	Implement the Python Programming in Arduino.
CO5	Demonstrate python proficiency in handling Data Science.

Text Books:	
1.	Fundamentals of Python Programming, Richard L. Halterman, Southern Adventist University, Year: 2019
2.	Python Programming for Arduino, Pratik Desai ,Packt Publishing Ltd, 2015.
3.	Python for Data Science by Luca Massaron and John Paul MuellerPublished by: John Wiley & Sons, Inc., 2015.
Reference Books:	
1.	Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think- python/)

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Laboratory- 50 Marks

The laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of the marks over number of weeks is considered for 30 marks. At

the end of the semester a test is conducted for 10 marks. The students are encouraged to implement additional innovative experiments in the lab and are awarded 10 marks. Total marks for the laboratory is 50.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks are executed by means of an examination.

The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom’s taxonomy level.

CO-PO Mapping												
CO/P O	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	3	3	3	2	2	-	-	1	-	-	1
CO2	3	3	3	3	2	2	-	-	1	-	-	1
CO3	3	3	3	3	2	2	-	-	1	-	-	1
CO4	3	3	3	3	2	2	-	-	1	-	-	1
CO5	3	3	3	3	2	2	-	-	1	-	-	1

High-3, Medium-2, Low-1

SEMESTER: V		
IOT (THEORY AND PRACTICAL)		
Course Code: MVJ21IO54		CIE Marks:50+50
Credits: L:T:P: 3:0:2		SEE Marks: 50 +50
Hours:40 L+ 26 P		SEE Duration: 03+03 Hours
Course Learning Objectives: The students will be able to		
1	To understand the various modes of communications with Internet.	
2	To learn the basic issues, policy, and challenges on the Internet	
3	To get an idea of some of the application areas where Internet of Things can be applied.	
4	To understand the cloud and internet environment	

UNIT-I	
<p>Prerequisites : Basic Knowledge about C or C++</p> <p>Introduction to IoT: Definition – Foundations – Challenges and Issues - Identification - Security. Components in internet of things: Control Units – Sensors – Communication modules –Power Sources – Communication Technologies – RFID – Bluetooth – Zigbee – Wifi – Rflinks –Mobile Internet – Wired Communication-IoT Platform Overview-Raspberry pi-Arduino boards. *</p> <p>Laboratory Sessions/ Experimental learning: Comparative study of Oracle, IBM and Cisco Architectures of IoT</p> <p>Applications: Sensors in IoT.</p> <p>Video link / Additional online information (related to module if any):</p> <ol style="list-style-type: none"> 1. http://www.theinternetofthings.eu/what-is-the-internet-of-things. 2. https://www.engineersgarage.com/article_page/sensors-different-types-of-sensors 3. https://www.educba.com/applications-of-sensors/ 	10 Hr s

* Programming Assignments are Mandatory.	
UNIT-II	
<p>IoT Protocols: Protocol Standardization for IoT-M2M and WSN Protocols- SCADA and RFID Protocols-Issues with IoT Standardization-Protocols-IEEE 802.15.4-BACNet Protocol-Zigbee Architecture - Network layer – APS Layer – Security. *</p> <p>Laboratory Sessions/ Experimental learning: Implement an IoT architecture to design an application of your own.</p> <p>Applications: IoT Protocol Applications</p> <p>Video link / Additional online information (related to module if any):</p> <p>https://inductiveautomation.com/resources/article/what-is-scada</p> <p>https://iotbytes.wordpress.com/application-protocols-for-iot/</p> <p>https://data-flair.training/blogs/iot-protocols/</p> <p>https://www.avsystem.com/blog/iot-protocols-and-standards/</p> <p>* Programming Assignments are Mandatory.</p>	10 Hr s
UNIT-III	
<p>Resource Management in the Internet of Things: Clustering - Software Agents - Data Synchronization - Clustering Principles in an Internet of Things Architecture - The Role of Context - Design Guidelines -Software Agents for Object – Data Synchronization- Types of Network Architectures - Fundamental Concepts of Agility and Autonomy-Enabling Autonomy and Agility by the Internet of Things - The Evolution from the RFID-based EPC Network to an Agent based Internet of Things- Agents for the Behaviour of Objects.*</p> <p>Laboratory Sessions/ Experimental learning:</p> <p>1. Weather monitoring using Blynk/ThingSpeak</p>	10 Hr s

<p>2. Design a people counter using Node MCU</p> <p>3. Christmas light show with Arduino</p> <p>Applications: RFID Applications</p> <p>Video link / Additional online information (related to module if any):</p> <p>RFID Applications:</p> <ol style="list-style-type: none"> 1. https://www.digiteum.com/rfid-technology-internet-of-things 2. https://www.uio.no/studier/emner/matnat/ifi/INF5910CPS/h10/undervisningsmateriale/RFID-IoT.pdf <p>* Programming Assignments are Mandatory.</p>	
UNIT-IV	
<p>Case Study and IoT Application Development: IoT applications in home-infrastructure security-Industries- IoT electronic equipment's. Use of Big Data and Visualization in IoT Industry 4.0 concepts - Sensors and sensor Node – Interfacing using Raspberry Pi/Arduino- Web Enabled Constrained Devices. *</p> <p>Laboratory Sessions/ Experimental learning: Interfacing using Raspberry Pi/Arduino</p> <p>Applications: Elements in group</p> <p>Video link / Additional online information (related to module if any):</p> <ol style="list-style-type: none"> 1. https://www.simform.com/home-automation-using-internet-of-things/ 2. https://iot5.net/iot-applications/smart-home-iot-applications/ 3. https://maker.pro/raspberry-pi/tutorial/how-to-connect-and-interface-raspberry-pi-with-arduino# 4. https://create.arduino.cc/projecthub/ruchir1674/how-to-interface-arduino-with-raspberrypi-504b06 <p>* Programming Assignments are Mandatory.</p>	10 Hr s

UNIT-V	
<p>Web of Things: Web of Things versus Internet of Things-Architecture Standardization for WoT-Platform Middleware for WoT- WoT Portals and Business Intelligence-Cloud of Things: Grid/SOA and Cloud Computing-Cloud Standards –Cloud of Things Architecture-Open Source e-Health sensor platform.</p> <p>Laboratory Sessions/ Experimental learning: Web Application Development</p> <p>Applications: Multiple IoT domains, Including Smart Home, Industrial, Smart City, Retail, and Health applications</p> <p>Video link / Additional online information (related to module if any):</p> <ol style="list-style-type: none"> 1. https://www.water-io.com/iot-vs-wot 2. https://www.talend.com/resources/iot-cloud-architecture/ <p>* Programming Assignments are Mandatory.</p>	10 Hr s

LABORATORY EXPERIMENTS	
<ol style="list-style-type: none"> 1. Write a program for interface Arduino Uno with DHT Sensor to print Humidity and Temperature. 2. Write a program for interface Arduino Uno with Smoke Sensor to print digital and analog output. 3. Write a program for interface Arduino Uno with LM-35 Sensor for analog output result. 4. Write a program for interface Arduino Uno with LDR (Light Dependent Resistor) Sensor. 5. Write a program for interface Arduino Uno with Magnetic Sensor. 6. Write a program for sending the data of Serial communication between Gateway and Arduino. 7. Write a program for establishing Wifi IOT module with Arduino uno. 8. Write a program for Communication between gateways to an end node. 9. Write a program for Send data on Thing speak with end node and display those data on LCD. 	

Course Outcomes: After completing the course, the students will be able to	
CO1	Identify the components of IoT.

C02	Analyse various protocols of IoT.
C03	Design portable IoT using appropriate boards
C04	Develop schemes for the applications of IOT in real time scenarios.
C05	Design business Intelligence and Information Security for WoT

Reference Books	
1	Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective" -CRC Press-2012.
2	Dieter Uckelmann, Mark Harrison, "Architecting the Internet of Things", Springer2011.
3.	Arshdeep Bahga, Vijay Madisetti, "Internet of Things (A Hands-On-Approach)", VPT, 2014.
4.	Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.
5	Luigi Atzori, Antonio Lera, Giacomo Morabito, "The Internet of Things: A Survey", Journal on Networks, Elsevier Publications, October 2010.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the self -study are 20 (2 presentations are held for 10 marks each). The marks obtained in test, quiz and self -studies are added to get marks out of 100 and report CIE for 50 marks.

Laboratory- 50 Marks

The laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of the marks over number of weeks is considered for 30 marks. At the end of the semester a test is conducted for 10 marks. The students are encouraged to implement additional innovative experiments in the lab and are awarded 10 marks. Total marks for the laboratory is 50.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks are executed by means of an examination.

The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom’s taxonomy level.

Laboratory- 50 Marks

Experiment Conduction with proper results is evaluated for 40 marks and Viva is for 10 marks. Total SEE for laboratory is 50 marks.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	-	-	-	-	-	-	-	-	3
CO2	3	3	1	-	-	-	-	-	-	-	-	3
CO3	3	3	1	2	-	-	-	-	-	1	-	3
CO4	3	3	3	3	-	-	-	2	2	2	-	3
CO5	3	3	3	3	-	-	2	2	3	2	-	3

Semester: V		
INDUSTRY 4.0 AND IIOT (PEC)		
Course Code: MVJ21IO551		CIE Marks: 50
Credits: L:T:P: 3:0:0		SEE Marks: 50
Hours: 40L		SEE Duration: 3 Hrs.
Course Learning Objectives: The students will be able to		
1	To impart basic concepts of IIoT and its implementation	
2	To Understand potential gains of IIoT business incentives and models	
3	To understand the working of IIoT through case studies	
4	To understand the technical issues required to build an IIoT network	
5	To provide business and technology participants with the information required in deploying and delivering an IIoT network.	

UNIT-I	
<p>Introduction to the Industrial Internet: Basic introduction, What Is the Industrial Internet?, The Power of 1%, Key IIoT Technologies, Why Industrial Internet and Why Now?, Catalysts and Precursors of the IIoT, Innovation and the IIoT, Intelligent Devices, Key Opportunities and Benefits, The Digital and Human Workforce Industrial Internet Use-Cases: Healthcare, Oil and Gas Industry, Smart Office, Logistics and the Industrial Internet, IOT Innovations in Retail.</p> <p>Video link:</p> <p>http://www.nitttrc.edu.in/nptel/courses/video/106105195/lec6.pdf • https://www.academia.edu/38736167/The_Industrial_Internet_of_Things_Industry_4_0 • https://nptel.ac.in/courses/106105195</p>	8 Hr s
UNIT-II	
<p>IIoT Reference Architecture: Introduction, The IIC Industrial Internet Reference, Architecture, Industrial Internet Architecture Framework (IIAF), Industrial Internet Viewpoints, The Business Viewpoint, The Usage Viewpoint, The Functional Viewpoint, Implementation Viewpoint, The Three-Tier Topology, Connectivity, Key System Characteristics, Data Management, Advanced Data Analytics.</p> <p>Video link:</p>	8 Hr s

http://www.nitttrc.edu.in/nptel/courses/video/106105195/lec6.pdf • https://www.academia.edu/38736167/The_Industrial_Internet_of_Things_Industry_4_0 • https://nptel.ac.in/courses/106105195		
UNIT-III		
Designing Industrial Internet Systems: Introduction, The Concept of the IIoT, The Proximity Network, WSN Edge Node, WSN Network Protocols, Legacy Industrial Protocols, Modern Communication Protocols, Wireless Communication Technologies, Gateways. Video link: http://www.nitttrc.edu.in/nptel/courses/video/106105195/lec6.pdf • https://www.academia.edu/38736167/The_Industrial_Internet_of_Things_Industry_4_0 • https://nptel.ac.in/courses/106105195		8 Hr s
UNIT-IV		
Introducing Industry 4.0: Introduction, Defining Industry 4.0, Why Industry 4.0 and Why Now?, Four Main Characteristics of Industry 4.0, The Value Chain, Industry 4.0 Design Principles, Building Blocks of Industry 4.0, Industry 4.0 Reference Architecture. Video link: http://www.nitttrc.edu.in/nptel/courses/video/106105195/lec6.pdf • https://www.academia.edu/38736167/The_Industrial_Internet_of_Things_Industry_4_0 • https://nptel.ac.in/courses/106105195		8 Hr s
UNIT-V		
Smart Factories: Introducing the Smart Factory, Smart Factories in Action, Why Smart Manufacturing Is Important, Winners and Losers?, Real-World Smart Factories, Industry 4.0: The Way Forward. Video link: http://www.nitttrc.edu.in/nptel/courses/video/106105195/lec6.pdf • https://www.academia.edu/38736167/The_Industrial_Internet_of_Things_Industry_4_0 • https://nptel.ac.in/courses/106105195		8 Hr s

Course Outcomes: After completing the course, the students will be able to	
CO1	Define IIoT and Industry 4.0, and list the uses of IIoT
CO2	Describe the IIoT architecture
CO3	Discuss the concepts used to design and implement IIoT.

CO4	Explain the need of Industry 4.0 and design principles.
CO5	Discuss the development of smart factories based in IIoT and Industry 4.0 protocols

Reference Books	
1.	"Industry 4.0: The Industrial Internet Of Things" by Alasdair Gilchrist, Apress Publications, 2016
2.	"Introduction to Industrial Internet of Things and Industry 4.0" by Sudip Misra, Chandana Roy, Anandarup Mukherjee, CRC Press, 2020

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	1	-	-	-	-	-	1
CO2	3	3	3	2	1	1	-	-	-	-	-	1
CO3	3	3	3	2	1	1	-	-	-	-	-	1
CO4	3	3	3	2	1	1	-	-	-	-	-	1
CO5	3	3	3	2	1	1	-	-	-	-	-	1

Semester: V		
LINEAR IC'S AND APPLICATIONS (PEC)		
Course Code: MVJ21IO552		CIE Marks: 50
Credits: L:T:P: 3:0:0		SEE Marks: 50
Hours: 40L		SEE Duration: 3 Hrs.
Course Learning Objectives: The students will be able to		
1	Define the basic concepts of OP-Amp, various parameters of Op-Amp, its characteristics and specifications.	
2	Analyse Op-Amp circuits to determine Input Impedances, output Impedances and other performance parameters.	
3	Sketch and Explain typical Frequency Response graphs for each of the Filter circuits.	
4	Describe and Sketch the various switching circuits of Op-Amps and analyse its operations.	
5	Differentiate between various types of DACs and ADCs and evaluate the performance of each with neat circuit diagrams.	

UNIT-I	
<p>Operational Amplifier Fundamentals: Basic Op-amp circuit, Op-Amp parameters – Input and output voltage, CMRR and PSRR, offset voltages and currents, Input and output impedance, Slew rate and Frequency limitations. OP-Amps as DC Amplifiers – Biasing OP-amps, Direct coupled voltage followers, Non-inverting amplifiers, inverting amplifiers, Summing amplifiers, and Difference amplifiers.</p> <p>Laboratory Sessions/ Experimental learning:</p> <ol style="list-style-type: none"> To obtain the Gain of inverting & non inverting amplifier by varying the resistor values. <p>Applications: Sensors, Mixers.</p> <p>Video link / Additional online information: https://www.youtube.com/watch?v=clTA0pONnMs</p>	Hrs
UNIT-II	
Op-Amps as AC Amplifiers: Capacitor coupled voltage follower, High input impedance – Capacitor coupled voltage follower, Capacitor	Hrs

<p>coupled non inverting amplifiers, High input impedance – Capacitor coupled Non-inverting amplifiers, Capacitor coupled inverting amplifiers, setting the upper cut-off frequency, Capacitor coupled difference amplifier. OP-Amp Applications: Current amplifiers, instrumentation amplifier, Precision Half wave rectifiers, Precision Full wave rectifiers - Half wave rectifier & Summing Amplifier.</p> <p>Laboratory Sessions/ Experimental learning:</p> <ol style="list-style-type: none"> 1. Design and find the gain of a Differential Amplifier. <p>Applications: Industrial areas (Temperature Indicator, Light Intensity Meter, Temperature Controller)</p> <p>Video link / Additional online information: https://www.youtube.com/watch?v=GjG8oshYNLQ</p>	
UNIT-III	
<p>Op-amp Applications: Limiting circuits - Peak Clipper, Clamping circuits, Precision Rectifier Peak Detectors, Sample and hold circuits, Differentiating Circuit, Integrator Circuit, Phase shift oscillator, Wein bridge oscillator, Zero Crossing detectors, inverting Schmitt trigger, Log and antilog amplifiers, Multiplier, and divider.</p> <p>Laboratory Sessions/ Experimental learning:</p> <ol style="list-style-type: none"> 1. Design and verify a sample and hold circuit using IC 741 opamp. <p>Applications: Quartz watches, various radio, TV, and other communication devices, alarms and buzzes.</p> <p>Video link / Additional online information: https://www.youtube.com/watch?v=xki9taCqsWY</p>	Hrs
UNIT-IV	
<p>Active Filters: First order and second order active Low-pass and high pass filters, Bandpass Filter, Band stop Filter. Voltage Regulators: Introduction, Series Op-amp regulator, IC voltage regulators, Voltage follower regulator, 723 general purpose regulators - Introduction, Low Voltage Regulator, High Voltage Regulator.</p>	Hrs

<p>Laboratory Sessions/ Experimental learning:</p> <ol style="list-style-type: none"> 1. Design & setup a low voltage regulator for an output voltage of 6V using 723 IC. <p>Applications: Communication systems, Audio systems and Biomedical instruments</p> <p>Video link / Additional online information: https://www.youtube.com/watch?v=y5s4bQnmV-g</p>	
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UNIT-V

<p>Phase locked loop: Basic Principles, Phase detector/comparator, VCO.</p> <p>DAC and ADC convertor: DAC using R-2R, ADC using Successive approximation.</p> <p>Other IC Application: 555 timer, Basic timer circuit, 555 timer used as astable and monostable multivibratos.</p> <p>Specialized IC Applications: Introduction on Universal active filters, Power amplifiers- LM380 Power Audio amplifier.</p> <p>Laboratory Sessions/ Experimental learning:</p> <ol style="list-style-type: none"> 1. Demonstrate a simple light circuit that uses a decade counter to drive two traffic lights and uses 555 timer chip as clock. <p>Applications: PWM (Pulse Width Modulation) & PPM (Pulse Position Modulation), Analog frequency meters, Digital logic probes.</p> <p>Video link / Additional online information: https://www.youtube.com/watch?v=-KMAQxc3J3g</p>	Hrs
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Course Outcomes: After completing the course, the students will be able to	
CO1	Acquire knowledge about fundamental concepts of Op-Amp circuit and parameters.
CO2	Describe AC Amplifiers and application.
CO3	Develop circuits for Op-Amp based linear and non-linear circuits.
CO4	Acquire knowledge about Active Filters and Voltage Regulators.
CO5	Explain applications of linear ICs in phase detector, VCO, DAC, ADC and Timer.

Reference Books

Semester: V		
SOFTWARE ENGINEERING (PEC)		
Course Code: MVJ21IO553		CIE Marks: 50
Credits: L:T:P: 3:0:0		SEE Marks: 50
Hours: 40L		SEE Duration: 3 Hrs.
Course Learning Objectives: The students will be able to		
1	Understand principles, concepts, methods, and techniques of the software engineering approach to producing quality software (particularly for large, complex systems).	
2	Impart skills in the design and implementation of efficient software systems across disciplines.	
3	Familiarize engineering practices and standards used in developing software products and components.	
4	Gather knowledge on various software testing, maintenance methods.	

UNIT-I	
<p>INTRODUCTION TO SOFTWARE ENGINEERING: The Evolving nature of software engineering, Changing nature of software engineering, Software engineering Layers, The Software Processes, Software Myths.</p> <p>PROCESS MODELS: A Generic Process Model, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Spiral Model, the Unified Process, Personal and Team Process Models, the Capability Maturity Model Integration (CMMI).</p> <p>Laboratory Sessions/ Experimental learning:</p> <p>To write the SRS for the given real time application using report writing tools.</p> <p>Applications: In Software development process.</p> <p>Video link / Additional online information: https://nptel.ac.in/courses/106105182/</p>	8 Hrs
UNIT-II	
<p>REQUIREMENTS ENGINEERING: Functional and Non-Functional Requirements, The Software requirements Document, Requirements Specification, requirements Engineering, Requirements Elicitation and</p>	8 Hrs

<p>Analysis, Requirement Validation, Requirement Management, System Modelling: Context Models, Interaction Models, Structural Models, Behavioural Model, Model-Driven Engineering.</p> <p>DESIGN CONCEPTS: The Design Process, Design Concepts, The Design Models, Architectural Design: Software Architecture, Architectural Genres, Architectural Styles.</p> <p>Applications: In Software development process.</p> <p>Video link / Additional online information:</p> <p>https://www.coursera.org/lecture/client-needs-and-software-requirements/3-2-4-use-cases-bZNCr</p>	
UNIT-III	
<p>DESIGN AND IMPLEMENTATION: The Object-Oriented Design with UML, Design Patterns, Implementation Issues, Open-Source Development. User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Design Evaluation. SOFTWARE TESTING STRATEGIES: A Strategic approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Validation Testing, System Testing, The Art of Debugging, White-Box Testing, Black Box Testing.</p> <p>Laboratory Sessions/ Experimental learning:</p> <p>Using Selenium IDE write a test suite containing minimum 4 test cases.</p> <p>Applications: In Software development process.</p> <p>Video link / Additional online information:</p> <p>https://www.youtube.com/watch?v=T3q6QcCQZQg</p>	8 Hrs
UNIT-IV	
<p>PRODUCT METRICS: A Framework for Product Metrics, Metrics for the Requirements Model, Metrics for Design Model, Metrics for Source Code, Metrics for Testing.</p> <p>PROCESS AND PROJECT METRICS: Metrics in the Process and Project Domains, Software Measurements, Metrics for Software Quality, Risk Management: Risk verses Proactive Risk Strategies, Software Risks, Risk</p>	8 Hrs

<p>Identification, Risk Projection, Risk Refinements, Risk Mitigation Monitoring and Management (RMMM), The RMMM Plan.</p> <p>Laboratory Sessions/ Experimental learning: Create a project using MS projects for any real time scenario.</p> <p>Applications: In Software development process.</p> <p>Video link / Additional online information: https://youtu.be/tIZ1dg4pxCE</p>	
UNIT-V	
<p>QUALITY MANAGEMENT: Quality Concepts, Software Quality, Software Quality Dilemma, Achieving Software Quality, Review Techniques, Reviews: A Formal spectrum, Informal Reviews, Formal Technical Reviews,</p> <p>SOFTWARE QUALITY ASSURANCE: Background Issues, Elements of Software Quality Assurance, Tasks, Goals and Metrics, Software Reliability, the ISO 9000 Quality Standards.</p> <p>Laboratory Sessions/ Experimental learning: Estimation of test coverage metrics using manual test metrics.</p> <p>Applications: In Software development process.</p> <p>Video link / Additional online information: https://nptel.ac.in/courses/110105039/</p>	8 Hrs

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand various Process Models.
CO2	Investigate various requirements engineering and apply design concepts.
CO3	Identify numerous Software Testing Strategies.
CO4	Evaluate Process and Project Metrics.
CO5	Illustrate Quality Management and Software Quality Assurance Concepts

Reference Books	
1.	Roger S. Pressman (2011), Software Engineering, A Practitioner's approach, 7 th edition, McGraw Hill International Edition, New Delhi
2.	Sommerville (2001), Software Engineering, 9 th edition, Pearson education, India
3.	K. K. Agarval, Yogesh Singh (2007), Software Engineering, 3rd edition, New Age

	International Publishers, India.
4.	Lames F. Peters, Witold Pedrycz(2000), Software Engineering an Engineering approach, John Wiely & Sons, New Delhi, India

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom’s taxonomy level.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2	-	-	1	2	2	2	-
CO2	2	2	2	2	2	1	-	1	2	2	2	1
CO3	2	2	2	2	2	1	-	1	2	2	2	-
CO4	1	2	2	2	2	1	-	1	2	2	2	1
CO5	1	2	2	1	2	1	2	1	2	2	2	2

Semester: V		
WIRELESS AND CELLULAR COMMUNICATION (PEC)		
Course Code: MVJ21IO554		CIE Marks: 50
Credits: L:T:P: 3:0:0		SEE Marks: 50
Hours: 40L		SEE Duration: 3 Hrs.
Course Learning Objectives: The students will be able to		
1	Understand mobile radio communication principles and to study the recent trends adopted in cellular systems and wireless standards.	
2	Familiarize students to radio signal propagation mechanisms and to the characteristics of mobile radio channels, which both are needed in the designing of modern wireless communication systems and networks.	
3	Study the concepts of cellular communication system, architecture, functioning, various standards	
4	Learn the concepts of signal propagation in cellular environment	
5	Study the different multiple access techniques for Wireless Communication	

UNIT-I	
<p>Introduction to Cellular Mobile Systems: The Cellular concept, System design, Capacity improvement in cellular systems, Co-channel interference reduction. Intelligent cell concept and applications, technical Challenges.</p> <p>Laboratory Sessions/ Experimental learning:</p> <ol style="list-style-type: none"> 1. Understand how pulse shaping is realized using MATLAB® functions <p>Applications:</p> <ol style="list-style-type: none"> 1. Transmission of music, news, road conditions, weather reports, and other broadcast information are received via digital audio broadcasting (DAB) with 1.5Mbit/s. 2. A universal mobile telecommunications system (UMTS) phone might be available offering voice and data connectivity with 384kbit/s. <p>Video link / Additional online information:</p>	8 Hrs

<p>1. https://www.coursera.org/lecture/wireless-communications/1-1-cellular-communication-KpitQ https://nptel.ac.in/courses/117/102/117102062/</p>	
UNIT-II	
<p>Mobile radio propagation: Reflection, Diffraction, Fading, Multipath Propagation, Channel modelling, Diversity Schemes and Combining Techniques. The cellular fundamentals: cellular communication and frequency reuse, general architecture of a cellular system, channel assignment strategies, hand-off in a cellular system. Interference and cellular system capacity: co-channel interference and adjacent channel interference, power control.</p> <p>Laboratory Sessions/ Experimental learning:</p> <ol style="list-style-type: none"> 1. Compute the power of the noise and the original signal. Find signal to noise ratio (SNR), compare it with the desired value and see if they are the same using MATLAB <p>Applications:</p> <ol style="list-style-type: none"> 1. International broadcasting, long distance aircraft and ship communication, citizen band (CB) radios. 2. Diffraction and reflection give rise to propagation beyond the horizon. Propagation at large distance propagates well within buildings. <p>Video link / Additional online information:</p> <ol style="list-style-type: none"> 1. https://freevidelectures.com/course/2329/wireless-communication/14 https://nptel.ac.in/courses/108/108/108108148/ 	8 Hrs
UNIT-III	
<p>Signal propagation in mobile communication: Design parameters at the base station, Practical link budget design using path loss models. propagation path loss, outdoor propagation models (Okumura model & Hata model), indoor propagation models, power delay profile, channel</p>	8 Hrs

<p>parameters (delay spread, doppler spread, coherence bandwidth, coherence time, Smart antenna systems, Beam forming. MIMO Systems. RAKE receiver.</p> <p>Laboratory Sessions/ Experimental learning:</p> <ol style="list-style-type: none"> 1. Performance of Baseband QAM/QPSK Under AWGN Channel <p>Applications:</p> <ol style="list-style-type: none"> 1. Antennas mounted on these structures pump out wireless communications signals to devices in the field via electromagnetic waves. 2. Wireless signal propagation is the movement of these radio waves (which move at the speed of light) to and from these sites and devices. <p>Video link / Additional online information:</p> <ol style="list-style-type: none"> 1. https://freevideolectures.com/course/2329/wireless-communication 2. https://web.stanford.edu/class/ee359/lectures.html <p>https://nptel.ac.in/courses/117/105/117105084/</p>	
UNIT-IV	
<p>Multuser Systems: CDMA- Principle, Network design, Link capacity, Power control, WCDMA-Network planning, MC-CDMA, OFDM, Cellular mobile communication beyond 3G. Wireless Personal Area Networks (Bluetooth, UWB and ZigBee), Wireless Local Area Networks (IEEE 802.11, network architecture, medium access methods, WLAN standards), Wireless Metropolitan Area Networks (WiMAX), Ad-hoc Wireless Networks.</p> <p>Laboratory Sessions/ Experimental learning:</p> <ol style="list-style-type: none"> 1. Develop a detector and calculate BER with MATLAB Simulation <p>Applications: Radio and TV Broad casting</p> <p>Video link / Additional online information:</p> <ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/108/104/108104157/ 2. https://nptel.ac.in/courses/106/105/106105173/ 	8 Hrs

https://nptel.ac.in/courses/111/102/111102130/	
UNIT-V	
<p>5G Radio Access Technologies: Access Design Principles for Multi-user Communications – Multi-carrier with Filtering – Non orthogonal Schemes for Efficient Multiple Access – Radio Access for Dense Deployments – Radio Access for V2X Communication – Radio Access for Massive Machine-type Communication.</p> <p>Laboratory Sessions/ Experimental learning:</p> <p>1. Implementation of channel estimation for multipath environment</p> <p>Applications: Television remote control, Wi-Fi, Cell phones, wireless power transfer, computer interface devices</p> <p>Video link / Additional online information:</p> <p>1. https://www.technologyreview.com/collection/wireless-technology-innovations-lead-the-way-to-a-smartly-connected-future/</p> <p>2. https://in.mathworks.com/videos/5g-new-radio-fundamentals-understanding-the-next-generation-of-wireless-technology-1561301737915.html</p> <p>https://nptel.ac.in/courses/117/104/117104099/</p>	8 Hrs

Course Outcomes: After completing the course, the students will be able to	
CO1	Discuss the cellular system design and technical challenges.
CO2	Analyse the Mobile radio propagation, fading, diversity concepts and the channel modelling.
CO3	Evaluate design parameters involved in the base station.
CO4	Discriminate Multiuser Systems, CDMA, WCDMA network planning and OFDM Concepts.
CO5	Describe the concepts of 5G Radio Access Technologies

Reference Books	
1.	T.S Rapaport, "Wireless Communications" 2 nd edition, Pearson Education, Noida, India.

2.	A. F. Molisch, Wireless Communications, Wiley, 2005.
3.	A. Goldsmith, Wireless Communications, Cambridge University Press, 2005.
4.	Andrea Goldsmith, "Wireless Communications", Cambridge University Press, 2005.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	1	-	-	-	-	-	1
CO2	3	3	3	2	2	1	-	-	-	-	-	1
CO3	3	3	3	2	2	1	-	-	-	-	-	1
CO4	3	3	3	2	2	1	-	-	-	-	-	1
CO5	3	3	3	2	2	1	-	-	-	-	-	1

Semester: V		
OPTICAL COMMUNICATION (PEC)		
Course Code: MVJ21IO555		CIE Marks: 50
Credits: L:T:P: 3:0:0		SEE Marks: 50
Hours: 40L		SEE Duration: 3 Hrs.
Course Learning Objectives: The students will be able to		
1	Learn the basic principles of optical fiber communication with different modes of light propagation.	
2	Study of optical sources, detectors, and receivers.	
3	Understand the transmission characteristics and losses in optical fiber and study optical components.	
4	Know the concept of WDM and system design.	
5	Learn the network standards in optical fiber and understand the network architectures along with its functionalities.	

UNIT-I	
<p>Optical fiber Communications: Historical development, General system, Advantages of optical fiber communication, Optical fiber wave guides: Ray theory transmission, Modes in planar guide, Phase and group velocity, cylindrical fiber: Modes, Step index fibers, Graded index fibers, Single mode fibers, Cutoff wavelength, Mode field diameter, effective refractive index, Fiber Materials, Photonic crystal fibers.</p> <p>Laboratory Sessions/ Experimental learning:</p> <p>1. Measurement of numerical aperture of an optical fiber.</p> <p>Applications: Networking, Telecommunication</p> <p>Video link / Additional online information:</p> <p>1. https://youtu.be/9seDKvbaoHU https://youtu.be/BGUhTDWkwx8</p>	8 Hrs
UNIT-II	
<p><i>Pre-requisite: Knowledge of Semiconductor Devices</i></p> <p>Optical sources: Light Emitting diodes: LED Structures, Light Source Materials, Quantum Efficiency and LED Power, Modulation. Laser Diodes:</p>	8 Hrs

<p>Modes and Threshold conditions, Rate equation, External Quantum Efficiency, Resonant Frequencies.</p> <p>Photo detectors: Physical principles of Photodiodes, Photo detector noise, Detector response time.</p> <p>Optical Receiver: Optical Receiver Operation: Error sources, Front End Amplifiers, Receiver sensitivity, Quantum Limit.</p> <p>Applications: Optical memories, OMEMS, Basic Principle Holography, Principle Of Hologram Recording</p> <p>Laboratory Sessions/ Experimental learning:</p> <p>1. To Investigate the Transmission (Intermodal dispersion) Characteristics of Multi-mode Optical Fiber.</p> <p>Applications: Networking, Telecommunication, Military and Space Applications</p> <p>Video link / Additional online information : https://youtu.be/15WuIWvjWEg</p>	
UNIT-III	
<p>Transmission characteristics of optical fiber: Attenuation, Material absorption losses, Linear scattering losses, Nonlinear scattering losses, Fiber bend loss, Dispersion, Chromatic dispersion, Intermodal dispersion: Multimode step index fiber.</p> <p>Optical Fiber Connectors: Fiber Splicing, Splicing Techniques, Splicing Single-Mode Fibers, Optical Fiber Connectors, Connector Types, Single-Mode Fiber Connectors, Connector Return Loss.</p> <p>Optical amplifiers: Basic application and Types, Semiconductor optical amplifiers, Erbium Doped Fiber Amplifiers, Raman Amplifiers, Wideband Optical Amplifiers.</p> <p>Laboratory Sessions/ Experimental learning:</p> <p>1. Measurement of propagation loss, bending loss of an optical fiber.</p> <p>Applications: Networking, Telecommunication , Automotive Industry</p>	8 Hrs

<p>Video link / Additional online information:</p> <p>1. https://youtu.be/BGUhTDWkwx8</p>	
UNIT-IV	
<p>WDM Concepts and Components: Overview of WDM: Operational Principles of WDM, WDM standards, Passive Optical couplers ,Mach-Zehnder Interferometer Multiplexers, Isolators and Circulators, Fiber grating filters, Dielectric Thin-Film Filters, Diffraction Gratings.</p> <p>Optical System Design: Point-to- Point Links, System Considerations, Link Power Budget, Rise Time Budget .Short-Wavelength Band, Attenuation-Limited Distances for Single-Mode Links.</p> <p>Laboratory Sessions/ Experimental learning:</p> <p>1. Determine the wavelength of light from a monochromatic source using Interferometer and calculate the refractive index of a thin film.</p> <p>Applications: Networking, Telecommunication</p> <p>Video link / Additional online information:</p> <p>1. https://youtu.be/t8a25L58-m8 https://vlab.amrita.edu/index.php?sub=1&brch=189</p>	8 Hrs
UNIT-V	
<p>Optical Networks: Optical network evolution and concepts: Optical networking terminology, Optical network node and switching elements, Wavelength division multiplexed networks, Public telecommunication network overview. Optical network transmission modes, layers and protocols: Synchronous networks, Asynchronous transfer mode, OSI reference model, Optical transport network, Internet protocol, Wavelength routing networks: Routing and wavelength assignment, Optical switching networks: Optical circuit switched networks, packet switched networks, Multiprotocol Label Switching, Optical burst switching networks.</p> <p>Laboratory Sessions/ Experimental learning:</p>	8 Hrs

<p>1. Analog and Digital (with TDM) communication link using optical fiber.</p> <p>Applications: Networking, Telecommunication</p> <p>Video link / Additional online information:</p> <p>1. http://ofcvlab.vesit.ves.ac.in/page2/honeycomb.html</p> <p>https://www.youtube.com/embed/f5EmFoXlYyQ</p>	
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Course Outcomes: After completing the course, the students will be able to	
CO1	Classify and working of optical fiber with different modes of signal propagation.
CO2	Analyze the characteristics of optical sources and detectors.
CO3	Describe the transmission characteristics and losses in optical fiber communication and identify various amplifiers.
CO4	Understand the concept of WDM and analyze the various aspects of system design.
CO5	Illustrate the networking aspects of optical fiber and describe various standards associated with it.

Text Books:	
1.	Gerd Keiser, Optical Fiber Communication, 5th Edition, McGraw Hill Education (India) Private Limited, 2015. ISBN:1-25-900687-5.
2.	John M Senior, Optical Fiber Communications, Principles and Practice, 3rd Edition, Pearson Education, 2010, ISBN:978-81-317-3266-3
Reference Books:	
1.	Joseph C Palais, Fiber Optic Communication , Pearson Education, 2005, ISBN:0130085103
2.	Ramaswami, Sivarajan and Sasaki "Optical Networks", Morgan Kaufmann, 2009.
3.	Ed Robert Kelsall, Ian Hamley, Mark Geoghegan, "Nanoscale Science and Technology", John Wiley, 2007.
4.	John F. Read, 'Industrial Applications of Lasers', Academic Press, 1978.

Continuous Internal Evaluation (CIE):
Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom’s taxonomy level.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	-	1	-	-	-	-	-	1
CO2	3	3	3	1	-	1	-	-	-	-	-	1
CO3	3	3	3	1	-	1	-	-	-	-	-	1
CO4	3	3	3	1	-	1	-	-	-	-	-	1
CO5	3	3	3	1	-	1	-	-	-	-	-	1

Semester: V		
ENVIRONMENTAL STUDIES (Theory)		
Course Code: MVJ21IO56		CIE Marks: 50
Credits: L:T:P: 1:0:0		SEE Marks: 50
Hours: 40L		SEE Duration: 3 Hrs.
Course Learning Objectives: The students will be able to		
1	Relate to interdisciplinary approach to complex environmental problems using basic tools of the natural and social sciences including geo-systems, biology, chemistry, economics, political science and international processes; Study drinking water quality standards and to illustrate qualitative analysis of water.	
2	Critically evaluate the science and policy ramifications of diverse energy portfolios on air and water quality, climate, weapons proliferation and societal stability.	

UNIT-I	
<p>Introduction to environmental studies, Multidisciplinary nature of environmental studies; Scope and importance; Concept of sustainability and sustainable development.</p> <p>Ecosystems (Structure and Function): Forest, Desert, Rivers, Ocean</p> <p>Biodiversity: Types, Hot spots; Threats and Conservation of biodiversity, Deforestation.</p> <p>Video link / Additional online information: https://nptel.ac.in/courses/120108004/</p>	6 Hrs
UNIT-II	
<p>Advances in Energy Systems (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind.</p> <p>Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable Mining, Cloud Seeding, and Carbon Trading.</p> <p>Video link / Additional online information: https://nptel.ac.in/courses/120108004/</p>	6 Hrs
UNIT-III	
<p>Environmental Pollution (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and</p>	6 Hrs

Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution. Waste Management & Public Health Aspects: Bio-medical Waste; Solid waste; Hazardous waste; E-waste. Video link: 1. https://nptel.ac.in/courses/122/106/122106030/ https://nptel.ac.in/courses/105/103/105103205/	
UNIT-IV	
Global Environmental Concerns (Concept, policies, and case-studies): Global Warming Climate Change; Acid Rain; Ozone Depletion; Fluoride problem in drinking water. Video link: https://nptel.ac.in/courses/122/106/122106030/	6 Hrs
UNIT-V	
Latest Developments in Environmental Pollution Mitigation Tools (Concept and Applications): G.I.S. & Remote Sensing, Environment Impact Assessment, Environmental Management Systems, ISO 14001. Video link: 1. https://nptel.ac.in/courses/105/102/105102015/ https://nptel.ac.in/courses/120/108/120108004/	6 Hrs

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale.
CO2	Develop critical thinking and/or observation skills and apply them to the analysis of a problem or question related to the environment.
CO3	Demonstrate ecology knowledge of a complex relationship between biotic and a biotic component.
CO4	Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.
CO5	Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale.

Text Books:

1.	Benny Joseph, "Environmental Studies", Tata Mc Graw – Hill. 2nd Edition, 2012.
2.	S M Prakash, "Environmental Studies", Pristine Publishing House, Mangalore 3 rd Edition, 2018.
Reference Books:	
1.	Raman Siva Kumar, "Principals of Environmental Science and Engineering", Cengage learning, Singapur. 2nd Edition, 2005
2.	G.Tyler Miller Jr., "Environmental Science – working with the Earth", Thomson Brooks /Cole, 11 th Edition, 2006.
3.	Pratiba Sing, Anoop Singh & Piyush Malaviya , "Text Book of Environmental and Ecology", Acme Learning Pvt. Ltd., New Delhi., 1 st Edition.

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

CIE is executed by way of quizzes (Q), tests (T) and assignments. A minimum of three quizzes are conducted along with tests. Test portion is evaluated for 50 marks and quiz is evaluated for 10 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three (conduct additional quizzes and take best three). The three tests are conducted for 50 marks each and the average of all the tests are calculated for 50. The marks for the assignments are 20 (2 assignments for 10 marks each). The marks obtained in test, quiz and assignment are added to get marks out of 100 and report CIE for 50 marks.

Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	-	2	2	1	1	-	2	1
CO2	3	3	2	1	-	1	2	-	1	1	2	1
CO3	3	3	2	1	-	2	2	-	1	1	2	1
CO4	3	3	2	2	-	2	2	-	1	1	2	1

Semester: V		
RESEARCH METHODOLOGY & IPR/LIFE SCIENCE (AEC5)		
Course Code: MVJ21IO57		CIE Marks: 50
Credits: L:T:P: 1:2:0		SEE Marks: 50
Hours: 30L		SEE Duration: 2 Hrs.
Course Learning Objectives: The students will be able to		
1	To give an overview of the research methodology and explain the technique of defining a research problem and explain the functions of the literature review in research.	
2	To explain carrying out a literature search, its review, developing theoretical and conceptual frameworks and writing a review and explain the art of interpretation and the art of writing research reports.	
3	To explain various forms of the intellectual property, its relevance and business impact in the changing global business environment.	
4	To discuss leading International Instruments concerning Intellectual Property Rights.	

UNIT-I	
<p>Research Methodology: Introduction, Meaning of Research, Objectives of Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Research Process, Criteria of Good Research, Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem.</p> <p>Video link / Additional online information: https://youtu.be/E2gGF1rburw</p>	6 Hrs
UNIT-II	
<p>Reviewing the literature: Place of the literature review in research, Improving research methodology, Enabling contextual findings, Review of the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed.</p> <p>Research Design: Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to</p>	6 Hrs

<p>Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs.</p> <p>Video link / Additional online information:</p> <p>https://youtu.be/E2gGF1rburw</p>	
UNIT-III	
<p>Design of Sample Surveys: Design of Sampling: Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs.</p> <p>Measurement and Scaling: Qualitative and Quantitative Data, Classifications of Measurement Scales, Goodness of Measurement Scales, Sources of Error in Measurement,</p> <p>Data Collection: Introduction, Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection,</p> <p>Video link / Additional online information:</p> <p>https://youtu.be/E2gGF1rburw</p>	6 Hrs
UNIT-IV	
<p>Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.</p> <p>Video link / Additional online information:</p> <p>https://youtu.be/E2gGF1rburw</p>	6 Hrs
UNIT-V	
<p>Intellectual Property: The Concept, Intellectual Property System in India, Development of TRIPS Complied Regime in India, The Designs Act, 2000, The Geographical Indications of Goods (Registration and Protection) Act 1999, Copyright Act, 1957, The Semi-Conductor Integrated Circuits Layout Design Act, 2000, Trade Secrets, Utility Models, IPR and Biodiversity, Duration of Protection, Trade Related Aspects of Intellectual</p>	6 Hrs

<p>Property Rights(TRIPS) Agreement, Covered under TRIPS Agreement, Features of the Agreement, Protection of Intellectual Property under TRIPS, Copyright and Related Rights, Trademarks, Geographical indications, Industrial Designs, Patents, Patentable Subject Matter, Rights Conferred, Exceptions, Term of protection, Conditions on Patent Applicants, Process Patents, Other Use without Authorization of the Right Holder, Layout-Designs of Integrated Circuits, Protection of Undisclosed Information, Enforcement of Intellectual Property Rights, UNSECO.</p> <p>Video link / Additional online information: https://youtu.be/5fvpsqPWZac</p>	
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Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the research problem and research process.
CO2	Understand research ethics.
CO3	Prepare a well-structured research paper and scientific presentations
CO4	Explore on various IPR components and process of filing.
CO5	Understand the adequate knowledge on patent and rights

Text Books:	
1.	C.R. Kothari, Gaurav Garg "Research Methodology: Methods and Techniques", New Age International. 4th Edition, 2018
2.	Ranjit Kumar, "Research Methodology a step – by step guide for beginners. (For the topic Reviewing the literature under module 2)", SAGE Publications Ltd 3rd Edition, 2011
3	Study Material, Professional Programme Intellectual Property Rights, Law and Practice, The Institute of Company Secretaries of India, Statutory Body Under an Act of Parliament, September 2013
Reference Books:	
1.	Trochim, "Research Methods: the concise knowledge base", Atomic Dog Publishing. 2005
2.	Fink A, "Conducting Research Literature Reviews: From the Internet to Paper", Sage Publications, 2009.

Continuous Internal Evaluation (CIE):

Semester: V		
UNIVERSAL HUMAN VALUES (Theory)		
Course Code: MVJ21UHVI58		CIE Marks: 50
Credits: L:T:P: 2:0:0		SEE Marks: 50
Hours: 40L		SEE Duration: 3 Hrs.
Course Learning Objectives: The students will be able to		
1	Appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.	
2	Facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.	
3	Highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.	

UNIT-I	
<p><i>Review on Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Self-exploration as the Process for Value Education, Happiness and Prosperity – Current Scenario,</i></p> <p>Value Education: Understanding Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, , Method to Fulfil the Basic Human Aspirations,</p> <p>Practical Sessions: Sharing about Oneself (Tutorial 1), Exploring Human Consciousness (Tutorial 2), Exploring Natural Acceptance (Tutorial 3)</p> <p>Video link:</p> <ol style="list-style-type: none"> https://www.youtube.com/watch?v=85XCw8SU084 https://www.youtube.com/watch?v=E1STJoXCXUU&list=PLWDeKF97v9SP_Kt6jqzA3p_Z3yA7g_OAQz <p>https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw</p>	4 Hr s

UNIT-II	
<p><i>Review on Understanding Human being as the Co-existence of the Self and the Body, The Body as an Instrument of the Self, Harmony of the Self with the Body.</i></p> <p>Harmony in the Human Being: Distinguishing between the Needs of the Self and the Body, Understanding Harmony in the Self, Program to ensure self-regulation and Health.</p> <p>Practical Sessions: Exploring the difference of Needs of Self and Body (Tutorial 4), Exploring Sources of Imagination in the Self (Tutorial 5), Exploring Harmony of Self with the Body (Tutorial 6).</p> <p>Video link:</p> <p>1. https://www.youtube.com/watch?v=GpuZo495F24 https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw</p>	4 Hr s
UNIT-III	
<p><i>Review on Harmony in the Family – the Basic Unit of Human Interaction, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society.</i></p> <p>Harmony in the Family and Society: 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Vision for the Universal Human Order,</p> <p>Practical Sessions: Exploring the Feeling of Trust (Tutorial 7), Exploring the Feeling of Respect (Tutorial 8), Exploring Systems to fulfil Human Goal (Tutorial 9).</p> <p>Video link:</p> <p>1. https://www.youtube.com/watch?v=F2KvW4WNnS8 https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw</p>	4 Hr s
UNIT-IV	

<p>Harmony in the Nature/Existence: Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.</p> <p>Practical Sessions: Exploring the Four Orders of Nature (Tutorial 10), Exploring Co-existence in Existence (Tutorial 11).</p> <p>Video link:</p> <ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=1HR-QB2mCF0 2. https://www.youtube.com/watch?v=lfN8g0xUSpw <p>https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw</p>	4 Hr s
UNIT-V	
<p><i>Review on Natural Acceptance of Human Values, Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Holistic Technologies, Production Systems and Management Models-Typical Case Studies.</i></p> <p>Implications of the Holistic Understanding – a Look at Professional Ethics: Definitiveness of (Ethical) Human Conduct, Competence in Professional Ethics, Strategies for Transition towards Value-based Life and Profession</p> <p>Practical Sessions: Exploring Ethical Human Conduct (Tutorial 12), Exploring Humanistic Models in Education (Tutorial 13), Exploring Steps of Transition towards Universal Human Order (Tutorial 14).</p> <p>Video link:</p> <ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=BikdYub6RY0 <p>https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw</p>	4 Hr s
<p>Course Outcomes: After completing the course, the students will be able to</p>	
CO1	Explore themselves, get comfortable with each other and with the teacher
CO2	Enlist their desires and the desires are not vague.

CO3	Restate that the natural acceptance (intention) is always for living in harmony, only competence is lacking
CO4	Differentiate between the characteristics and activities of different orders and study the mutual fulfilment among them
CO5	Present sustainable solutions to the problems in society and nature

Text Books:	
1.	AICTE SIP UHV-I Teaching Material, https://fdp-si.aicte india.org/ AicteSipUHV_download.php
2.	A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
3.	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
Reference Books:	
1.	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2.	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4.	The Story of Stuff (Book).
5.	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

Continuous Internal Evaluation (CIE):

Theory for 50 Marks

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Semester End Examination (SEE):

Total marks: 50+50=100

SEE for 50 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the entire syllabus. Part – B Students have to answer five questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have a maximum of

three sub divisions. Each unit will have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	-	-	-	2	2	3	2	1	2	1
CO2	-	1	-	-	-	2	2	3	2	1	2	1
CO3	-	1	-	-	-	2	2	3	2	1	2	1
CO4	-	1	-	-	-	2	2	3	2	1	2	1
CO5	-	1	-	-	-	2	2	3	2	1	2	1