Syllabus-2023-2024

BTech-ComputerScience

Title of the Course	Software Engineering
Course Code	CSL0303[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	0	3
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	student must have knowledge about basic data structures , computer organization & programming language concepts.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the basics of software engineering like characteristic, crisis of software and process of software engineering systems (Knowledge, Understand)**(BL2-Understand)** **CO2-** Apply the various SDLC, ER, DFD models, to collect SRS, And understand the software. (Apply).**(BL3-Apply)** **CO3-** Design the Design Strategies, Architectural Design concept for better development of software (Design).**(BL6-Create)** **CO4-** Explain various testing techniques and Analyze the concept of testing strategies (Analysis)**(BL4-Analyze)** **CO5-** Evaluating the need of Software Maintenance and Software Project Management Software, Need for Maintenance, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering and other inter process communication tech An Overview of CASE Tools, Constructive Cost Models (COCOMO), Software Risk Analysis and Management. (Investigation).**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✓ Environment ✕	**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)					

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	Lecturing	6
Unit-2	Planning: Software Requirement Specifications (SRS) Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Model.	Case Study	6
Unit-3	Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Function Point (FP) Based Measures, Cyclomatic Complexity.	Case Study	6
Unit-4	Testing: Software Testing, Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	Case Study	6
Unit-5	Maintenance: Software Maintenance and Software Project Management Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management, An Overview of CASE Tools, Constructive Cost Models (COCOMO), Software Risk Analysis and Management.	Lecturing	6

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
2,3,4	Case study	Case Study	BL5-Evaluate	15

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	12	60	18

Part E

Books	Pressman, R. S., & Dr, B. R. M. (2014, January 23). Software Engineering: A Practitioner's Approach. McGraw-Hill Education. http://books.google.ie/books?id=i8NmnAEACAAJ&dq=R.+S.+Pressman&hl=&cd=1&source=gbs_api (Pressman & Dr, 2014)
Articles	
References Books	Pressman, R. S., & Dr, B. R. M. (2014, January 23). Software Engineering: A Practitioner's Approach. McGraw-Hill Education. http://books.google.ie/books?id=i8NmnAEACAAJ&dq=R.+S.+Pressman&hl=&cd=1&source=gbs_api (Pressman & Dr, 2014)
MOOC Courses	
Videos	https://onlinecourses.nptel.ac.in/noc20_cs68/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	1	-	-	-	-	-	-	-	1	-	2
CO2	1	-	-	-	1	2	-	-	-	-	-	-	1	2	3
CO3	2	1	-	-	1	-	-	-	-	-	-	-	3	2	3
CO4	2	2	-	3	1	-	-	-	-	-	-	-	3	2	3
CO5	2	2	-	2	1	-	-	-	-	-	-	-	3	2	3
CO6	1	1	2	3	2	2	-	-	-	2	-	-	3	3	3

Syllabus-2023-2024

BTech-ComputerScience

Title of the Course	Artificial Intelligence
Course Code	CSL0501[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	To understand the contents and successfully complete this course, a participant must have a basic understanding of Statistical Data Analysis and visualization methods, and Python Programming.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Remember**(BL1-Remember)** **CO2-** understand**(BL2-Understand)** **CO3-** Analyze**(BL4-Analyze)** **CO4-** Evaluate**(BL5-Evaluate)** **CO5-** Create**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1:	Introduction to AI What is AI, Turing test, cognitive modelling approach, law of thoughts, the relational agent approach, the underlying assumptions about intelligence, techniques required to solve AI problems, level of details required to model human intelligence, successfully building an intelligent problem, history of AI	Lecturing	9
Unit 2 :	AI Systems and Techniques: Reasoning agents, Logic and inference via Logic Programming, Linked data, semantic net and internet search, planning under uncertainty, Adversarial search, game playing, Probabilistic inference, Natural language processing, approaches to machine translation.	Lecturing	9
Unit 3 :	AI Research Trends: Research trends in machine learning, deep learning, reinforcement learning, robotics, computer vision, natural language processing, collaborative systems, algorithmic game theory, internet of things (IoT), neuromorphic computing. Applications of AI by domain: Transportation, home/service robots, healthcare, education, lower source communities, public safety and security, employment and workplace, entertainment, finance, baking and insurance.	Case Study	9
Unit 4	Role of Artificial Intelligence in Society: Societal challenges AI presents, Ethical and Societal implications, policy and law for AI, fostering dialogue, sharing of best practices. Malicious Use of AI: Prevention and Mitigation: Security relevant properties of AI, Security domains and scenarios: digital security, physical security, pollical security, factors affecting the equilibrium of AI and security Explainable AI: Introduction to explainable AI, why explainable AI, interpretability and explain ability, methods of interpretability and explain ability.	Case Study	9
Unit 5	Introduction to Data Analytics: Working with Formula and Functions, Introduction to Charts, Logical functions using Excel, Analyzing Data with Excel.	Lecturing PBL	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Unit - I-V	PBL	PBL	BL6-Create	10
Unit -III - IV	Case Study	Case Study	BL4-Analyze	10
Unit II & V	Implement search algorithm of AI Develop an intelligent game using python Design a intelligent lock using python Elementary programs using LISP. Write a program to predict sales trends . Elementary program using prolog Write a program to design a NLP base user interface. Write a program to convert text to voice vice – versa. Apply and create formulas on excel sheet. Analyze the data using excel Visualize data in Excel using various types of charts.	Experiments	BL3-Apply	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Patterson, D. W. (1990, January 1). Introduction to Artificial Intelligence and Expert Systems.
Articles	
References Books	Rich, E., & Knight, K. (1991, January 1). Artificial Intelligence. McGraw-Hill Science, Engineering & Mathematics.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	1	2	-	-	-	2	-	-	1	-	1
CO2	2	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	2	2	2	2	-	-	-	-	-	-	-	2	2	3
CO4	-	2	-	3	1	-	-	-	-	1	-	-	2	3	3
CO5	1	1	-	2	-	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BCA

Title of the Course	Enterprice Resource Planning
Course Code	BCA 506

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	0	0	3
Course Type	Theory only							
Course Category	Disciplinary Major							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand- Comprehensive knowledge of the introduction of different applications of ERP systems**(BL2-Understand)** **CO2-** Applying: understand the importance of erp and be able to identify and describe typical functional modules in ERP system.**(BL3-Apply)** **CO3-** Analyzing: have a case study of erp design and implementation and describe the basic concepts and technologies used in ERP.**(BL4-Analyze)** **CO4-** Creating: develop projects requiring the implementation of various data structures. Students are able to understand the future scope of ERP.**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction: ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, and the Structure of ERP.	Lecturing	9
Unit 2	ERP Technologies: Business Process Reengineering, MIS, DSS, Data Warehousing, Data Mining, Online Analytic Processing (OLAP), Supply chain Management.	Lecturing	8
Unit 3	ERP Functional Modules: Business modules, Finance, Manufacturing, Human Resources, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution , Production Planning, Production Scheduling, Production Control	Lecturing	9
Unit 4	ERP Implementation: ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees	Lecturing	9
Unit 5	ERP & E-Commerce: ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture.	Lecturing	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Leon. (2007). ERP Demystified, 2/e. Tata McGraw-Hill Education. Garg, V. K., & Venkitakrishnan, N. K. (2003). ENTERPRISE RESOURCE PLANNING. PHI Learning Pvt. Ltd.
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	2	-	-	-	-	-	-	1	2	1	3
CO2	3	3	2	-	2	-	-	-	-	-	-	2	3	1	2
CO3	2	3	-	3	2	-	-	-	-	-	-	2	1	3	2
CO4	2	2	3	2	3	-	-	-	2	2	3	3	3	2	1
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BCA

Title of the Course	Data Ware housing and mining
Course Code	BCA 601

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					4	0	0	4
Course Type	Theory only							
Course Category	Disciplinary Minor							
Pre-Requisite/s	Student should be familiar with Discrete Mathematics, Probability, Statistics, Data structures and basics of RDBMS.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the Data mining techniques that help extract meaningful data.**(BL1-Remember)** **CO2-** To understand the basics of Data warehouse, Data marts, data preprocessing and techniques of data mining.**(BL2-Understand)** **CO3-** To implement the various methods of data mining for data clustering, classification: K-means, K- Medoids etc.**(BL3-Apply)** **CO4-** To analyze the concepts of data Preprocessing, Association Rule Mining, classification, clustering.**(BL4-Analyze)** **CO5-** To evaluate the data mining models that run efficiently.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG8(Decent work and economic growth) SDG10(Reduced inequalities)				

Part B

Modules	Contents	Pedagogy	Hours
1	Data Warehouse Concepts: Architecture, operations, Multidimensional Data Model, Data Warehouse Implementation, Data Cube Technology, Aggregation, OLAP functions and tools.	Lecturing, Case study	6
2	Needs of Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation, Online Data Storage, Concept Hierarchies – Concept Description Data Generalization and Summarization Based Characterization	Lecturing, Research	12
3	Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Major issues in Data Mining, Data Mining Primitives, Languages, and System Architectures, Architectures of Data Mining Systems, Classification by Decision Tree Induction , Bayesian Classification. Association Rule Mining, Mining, Single-Dimension Association Rules from Transactional Databases, Mining Multilevel ,Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining	Lecturing	5
4	Clusters Analysis: What is cluster analysis, Types of Data in Cluster Analysis, Categorization of Major Clustering Methods – Partitioning Methods : K-Means and K-Medoids, Hierarchical methods: Agglomerative and divisive clustering.	Lecturing ,Research	12
5	Applications of Data mining: Various areas of data mining with their features and specific design of mining system needed – Text Mining,	Lectures with whiteboard/PPT, Recorded video/interactive videos,	4

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1-2	Case Study on data warehouse architecture,schema & operations	Case Study	BL4-Analyze	4
1-4	Problem Based Learning	PBL	BL6-Create	5

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Han, J., Kamber, M., & Pei, J. (2011, June 9). Data Mining: Concepts and Techniques.
Articles	
References Books	Resources, M. A. I. (2012, November 30). Data Mining: Concepts, Methodologies, Tools, and Applications.
MOOC Courses	
Videos	Data Mining Introduction: https://www.youtube.com/watch?v=ykZ-_UGcYWgRule Generation:https://archive.nptel.ac.in/courses/106/105/106105174/

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	2	-	-	-	2	-	-	-	-	1
CO2	-	1	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	-	-	-	-	-	-	-	-	-	-	-	3	2	3
CO4	2	1	-	2	1	-	-	-	-	-	-	-	2	3	3
CO5	2	1	-	2	1	-	-	-	-	-	-	-	2	3	3
CO6	2	2	-	2	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BCA

Title of the Course	Entrepreneurship Development
Course Code	BCA-305

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	0	3
Course Type	Theory only							
Course Category	Interdisciplinary Major							
Pre-Requisite/s	Students should be familiar with the basic concepts of business.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** CO1- Students will recall the meaning, definition, and types of entrepreneurs. Students will be able to remember the functions and skills/traits required to be an entrepreneur. **(BL1-Remember)** **CO2-** CO2- Students will be in a position to explain the relationship between entrepreneurs and economic development and will understand the process of creating a business plan and conducting a feasibility study. They can explain the relevance of location, environmental regulatory requirements, and pricing strategies for new businesses**(BL2-Understand)** **CO3-** CO3- Students will be able to apply effective communication, leadership, marketing, and negotiation skills in entrepreneurial contexts. They will also apply time management skills to prioritize tasks and manage resources effectively. (BL3)**(BL3-Apply)** **CO4-** CO4- Students will be able to conduct the cost benefit analysis. They will be able to assess different sources of finance for entrepreneurial ventures and the support provided by government programs, grants, and schemes for entrepreneurs. **(BL4-Analyze)** **CO5-** CO5- Students will be able to evaluate the effectiveness of entrepreneurship development programs (EDPs) and assess the impact of government initiatives such as Make in India and Startup India on entrepreneurship. They will be able to evaluate the challenges faced by women entrepreneurs and propose strategies to overcome them.**(BL5-Evaluate)** **CO6-** CO6- Students will be able to create a comprehensive business plan for a new venture. Moreover, they will be able to design strategies to promote and support women entrepreneurship and create innovative approaches to address the challenges faced by entrepreneurs in India**(BL6-Create)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Unit-I- Introduction to Entrepreneur & Entrepreneurship Meaning, Definition, types of entrepreneurs, functions, skills/traits required to be an entrepreneur, entrepreneurs and economic development, problems faced by entrepreneurs in India, Social Entrepreneurship.	Lectures with whiteboard/PPT, Recorded video/interactive videos	5
2	Skills for Entrepreneurs Communication skills, creative thinking skills, leadership skills, marketing skills, negotiation skills, motivational skills, time management skills.	Lectures with whiteboard/PPT, Recorded video/interactive videos	8
3	Starting a new business Form of business organizations, creating a business plan, feasibility study of business plan, registering a business, relevance of location, environmental regulatory requirements, pricing of products, cost benefit analysis.	Lectures with whiteboard/PPT, Recorded video/interactive videos	10
4	Support to Entrepreneurs Concept of EDPs, Make in India, Startup India, Sources of Finance for Entrepreneurial Venture, Departments, Grants, Schemes & various policies and programs, Concept of MSMEs, Support to MSMEs in India.	Lectures with whiteboard/PPT, Recorded video/interactive videos	10
5	Women Entrepreneurship- Concept of women entrepreneurs, role played by women entrepreneurs in economic development, Challenges in being a women entrepreneur, status of women entrepreneurs in India, Strategies to promote women entrepreneurship, Govt. initiatives to promote women entrepreneurship in India.	Lectures with whiteboard/PPT, Recorded video/interactive videos	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Khanka, S. S. (2006). Entrepreneurial Development. S. Chand Publishing.
Articles	
References Books	Mariotti, S., & Glackin, C. (2012). Entrepreneurship and Small Business Management. Pearson Higher Ed. Hisrich, R., Shepherd, D., & Peters, M. (2016). Entrepreneurship. McGraw-Hill Education.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	2	-	-	-	-	-	-	-	-	1	2	3
CO2	-	-	-	-	-	1	-	-	2	-	-	-	2	3	3
CO3	1	-	-	-	-	-	-	-	-	-	-	-	1	3	-
CO4	-	-	2	-	-	-	-	-	-	-	-	-	2	-	-
CO5	1	-	-	2	-	-	-	-	-	-	-	-	2	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-

Syllabus-2023-2024

BCA

Title of the Course	Web Designing with PHP
Course Code	BCA-401(P)

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					0	0	3	3
Course Type	Lab only							
Course Category	Disciplinary Major							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various Web Development Strategies using PHP and syntax rules of web Programming**(BL1-Remember)** **CO2-** To understand the basics of web architecture, Development techniques, knowledge about file system.**(BL2-Understand)** **CO3-** To implement: HTML, JavaScript and Arry, strings, database connectivity to create Web applications.**(BL3-Apply)** **CO4-** To analyze various Server-side programming techniques and OOPS Techniques**(BL4-Analyze)** **CO5-** To evaluate and improve the performance of the web application with the help of session handling Techniques**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG5(Gender equality) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introducing PHP – history and Basic development Concepts, PHP delimiters, creating user-defined variables, data types with PHP, type casting – Creating first PHP Scripts, declaring and using constants, Using Variable and Operators, – Storing Data in variables -Setting and Checking variables Data types, comments with php, useful readymade function of PHP. Controlling Program Flow: making decisions with if, else, and switchwriting More Complex Conditional Statements – Repeating Action with Loops and super global variables.	Lectures with whiteboard/PPT, Recorded video/interactive videos	8
2	Use of HTML for web design and JavaScript-, html scripts and form elements, embedding php with HTML, redirecting web pages, adding dynamic content using Java script, Working with Numeric Functions. Working with Arrays: Storing Data in Arrays – Numerically index array, associative and multi-decisional, array Processing Arrays with Loops and Iterations – Using Arrays with Forms - Working with Array Functions, Array sorting, converting array to scalar variables – Working with Dates and Times	Lectures with whiteboard/PPT, Recorded video/interactive videos	8
3	String Handling: formatting strings, joining and splitting a string comparing strings matching and replacing substrings, string functions, introduction of php regular expression. Exception Handling: exception handling structure, try…catch…throw Introduction to file system- file system and uses, saving program data for later use for file system, opening a file, creating and writing to a file closing a file and deletion operation on file, reading data from a file, file handling functions. Processing Directories.	Lectures with whiteboard/PPT, Recorded video/interactive videos	8
4	Using PHP Functions and Classes: Introduction to functions. Creating userdefined function parameters, returning values, calling by values versus calling by reference, using include () and require () functions. Creating PHP Classes – Using Advanced OOP Concept, creating a PHP class, object, methods, operations, class attributes, class method invocation, php static hinting, object cloning, inheritance, final keyword, php abstract class, and interface.	Lectures with whiteboard/PPT, Recorded video/interactive videos	8
5	Working with Database: working on MYSQL database, connection PHP with MySQL, creating database tables, implementing insert delete, update and select query using PHP script,	Lectures with whiteboard/PPT, Recorded video/interactive videos	8

PBL TOPICS

PHP

1. **Simple CMS (Content Management System):**
- Build a basic CMS using PHP where users can create, edit, delete, and manage content (e.g., articles, blog posts).
- Include features like user authentication, role-based access control, and a WYSIWYG editor for content creation.

2. **Online Quiz System:**
- Develop an online quiz application where users can take quizzes on various topics.
- Implement features such as user registration, quiz creation, multiple-choice questions, scoring, and result display.

3. **Online Task Management System:**
- Create a task management application where users can create tasks, assign them to others, set deadlines, and track progress.
- Include features like user authentication, task categorization, priority levels, and status updates.

4. **E-commerce Website:**
- Build a simple e-commerce platform using PHP where users can browse products, add them to cart, and make purchases.
- Implement features like user registration, product catalog, shopping cart functionality, and payment integration (e.g., PayPal).

5. **OnlineStudent Information System:**
- Develop a student information system for managing student records, course details, grades, and attendance.
- Include features such as user authentication, student enrolment, course registration, and grade management.

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	VIKRAM VASWANI PHP A Beginner's Guide Tata McGraw-Hill
Articles	Steven Holzner The PHP Complete Reference – Tata McGraw-Hil
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	1	2	-	-	-	-	-	-	-	1	2	1
CO2	2	2	-3	2	1	-	-	-	-	-	-	-	2	2	2
CO3	2	1	1	1	3	-	-	-	-	-	-	-	1	2	1
CO4	1	2	-1	2	2	-	-	-	-	-	-	-	2	2	1
CO5	2	2	2	1	2	-	-	-	-	-	-	-	1	2	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BCA

Title of the Course	Python Programming
Course Code	BCA-403(T)

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	0	2	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic programming concept.**(BL1-Remember)** **CO2-** Understand the basics of Python like python origin downloading and installing and basic concepts of python.**(BL2-Understand)** **CO3-** Apply the various conditional and looping statement and functional programming.**(BL3-Apply)** **CO4-** Explain various objects numbers and sequence in python Analyze the concept of regular expression**(BL4-Analyze)** **CO5-** Evaluate the concept of object-oriented programming for better utilization of language**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction to Python programming Introduction, origin of Python, Downloading, Installing and Running Python, Python Basics: Comment, Identifier, Indentations, Basic data types, conversions, operators, Build in functions. I/O Statements, Condition Statements & Loops: If, else, elif), conditional expressions, while, for, break continue	Lectures	6
Unit 2	Data Structures in Python Lists: Introduction, Accessing list, Operations, Working with lists, Tuple: Introduction, Accessing tuples, Operations, Working with list, Dictionaries: Introduction, Accessing values in dictionaries, Working with dictionaries, Set: Introduction ,Accessing set, Operations, Working with sets	Lectures	6
Unit 3	Functions, Modules, File Handling Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous function, Global and local variables, Recursion. Modules: Creating modules, Importing module, Packages, File Handling :Opening and closing files, Reading and writing files	Experiments	6
Unit 4	Exceptional Handling, Regular Expressions Exception Handling: Exception, Exception Handling, Try and Except clause,User Defined Exceptions, Exception handling in files). Regular Expressions: Introduction/motivation, special symbols and characters for REs , Match function, Search function., Matching VS Searching., Modifiers, Patterns.	Experiments	6
Unit -5	Object Oriented Programming in Python Introduction, OOPS Basics: Class and object Constructors, Need of Encapsulations, Attributes, default attributes, static attributes, static methods, initializing objects, Pass by reference, self. Relational-ships: Introduction, Aggregation, Dependency. Inheritance: Need of Inheritance, Overriding, Super, Types of Inheritance. Abstract Class, methods.	PBL	6

Part C

S.NO.	Practical List
1	Program to count the number of each vowel in a string.
2	Program to Find Sum of Natural Numbers Using Recursion.

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Gondaliya, V. (2019, August 30). Programming With Python. Vaibhav Gondaliya.
Articles	
References Books	Hetland, M. L. (2006, November 7). Beginning Python. Apress
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	-	2	2	-	-	-	-	1	-	1	-	1
CO2	1	1	-	2	2	2	-	-	-	2	-	-	1	2	3
CO3	-	2	-	-	-	-	-	-	-	-	-	-	3	2	3
CO4	-	2	-	2	1	-	-	-	-	-	-	-	3	2	3
CO5	-	2	-	2	1	-	-	-	-	-	-	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BCA

Title of the Course	Web Technologies
Course Code	BCA102[P]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Disciplinary Minor							
Pre-Requisite/s	basic knowledge computer file system.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various Web Development Strategies and syntax rules of web Programming**(BL1-Remember)** **CO2-** To understand the basics of web architecture, Types of architecture, knowledge about web protocols and web development tools.**(BL2-Understand)** **CO3-** To implement: HTML, CSS, Javascript and XML web designing language to create Web pages.**(BL3-Apply)** **CO4-** To analyze various Client-side programming techniques and introduction of CSS for styling of the web page.**(BL4-Analyze)** **CO5-** To evaluate the web pages and layout with the help of Advanced CSS Techniques**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG10(Reduced inequalities) SDG12(Responsible consuption and production) SDG13(Climate action) SDG14(Life below water) SDG15(Life on land)				

Part B

Modules	Contents	Pedagogy	Hours
1	Prerequisite: basic knowledge computer file system. Introduction to Web Development: Web Development Strategies ,Websites for individual and Corporate World, Cyber Laws, Web Applications, Writing Web Projects, Identification of Objects, Target Users, Web Team, Planning and Process Development. Web Essentials: Concept of WWW, Internet and WWW, HTTP Protocol: Request and Response.	Lectures	10
2	Web Page Designing HTML: list, table, images, forms, Basics of HTML, formatting and fonts, commenting code, color, hyperlink, list, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5	Experiments	10
3	Style Sheets CSS-Introduction to Cascading Style Sheets, Features, Core Syntax, Style Sheets and HTML Style Cascading and Inheritance, Text Properties, Box Model, Normal Flow Box Layout, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of CSS3	Experiments	8
4	Scripting Java script: Introduction, documents, forms, statements, functions, objects; event and event handling; Introduction to client and server side scripting,data types, operators, conditional statement, loops in Java script, functions, arrays, objects and elements in Java script, form validation using Java script.,	PBL	9
5	Introduction to XML, uses of XML, simple XML, XML key components, DTD and	PBL	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Create a specimen of corporate web page. Divide the browser screen into two frames. The frame on the left will be a menu consisting of hyper links. Clicking on any of these link will lead to a new page, which must open in a target frame which is on right side.	Experiments	BL2-Understand	10
2-3	Write a java script code block, which validates a user name and password against hard coded values. If either name or password field is not entered display an error message showing “You forgot one of the required fields. Please try again” In case the field matched do not match the hard coded values, display an error message showing : “Please enter a valid user name and password” If the field entered matched , Display the following message: “Welcome (Username)”.	Experiments	BL3-Apply	10
4-5	Intelligent Tourist Guide: Nowadays people use mobile phones and other mobile devices. Most of us have a small computing device that is always with us. People use it example for calling, as calendar and organizer. Mobile devices with GPS receiver are also used to find paths in navigation. The main idea of this thesis was to design a system that will run on most of phones and palms and will be helpful when visiting some new places and cities.	PBL	BL5-Evaluate	30

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Jackson, J. C. (2020). Web Technologies: A Computer Science Perspective. Prentice Hall.Science Perspective;
Articles	
References Books	Bayross, I. (2019). Web Enabled Commercial. BPB Publications. Applications Development using HTML, DHTML, JavaScript, Perl CGI
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	3	2	-	-	-	-	-	-	-	1	-	1
CO2	-	1	1	1	3	-	-	-	-	-	-	-	2	-	3
CO3	2	1	-	1	1	-	-	-	-	-	-	-	3	2	3
CO4	1	2	1	1	1	-	-	-	-	-	-	-	2	3	3
CO5	-	1	-	-	1	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

MCA

Title of the Course	Programming with Python
Course Code	MCA 106-B(P)

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					0	0	3	3
Course Type	Lab only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic programming concept.**(BL1-Remember)** **CO2-** Understand the basics of Python like python origin downloading and installing and basic concepts of python.**(BL2-Understand)** **CO3-** Apply the various conditional and looping statement and functional programming.**(BL3-Apply)** **CO4-** Explain various objects numbers and sequence in python Analyze the concept of regular expression**(BL4-Analyze)** **CO5-** Evaluate the concept of object-oriented programming for better utilization of language**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG3(Good health and well-being) SDG4(Quality education) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction to Python programming Introduction, origin of Python, Downloading, Installing and Running Python, Python Basics: Comment, Identifier, Indentations, Basic data types, conversions, operators, Build in functions. I/O Statements, Condition Statements & Loops: If, else, elif), conditional expressions, while, for, break continue	Lectures	6
Unit 2	Data Structures in Python, Regular Expressions Lists: Introduction, Accessing list, Operations, Working with lists, Tuple: Introduction, Accessing tuples, Operations, Working with list, Dictionaries: Introduction, Accessing values in dictionaries, Working with dictionaries, Set: Introduction ,Accessing set, Operations, Working with sets Regular Expressions: Introduction/motivation, special symbols and characters for REs , Match function, Search function., Matching VS Searching., Modifiers, Patterns.	Lectures	12
Unit 3	Functions, Modules, File Handling Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous function, Global and local variables, Recursion. Modules: Creating modules, Importing module, Packages, File Handling: Opening and closing files, Reading and writing files	Lectures	10
Unit 4	Exceptional Handling, Object Oriented Programming in Python Exception Handling: Exception, Exception Handling, Try and Except clause, User Defined Exceptions, Exception handling in files). Object Oriented Programming in Python Introduction, OOPS Basics: Class and object Constructors, Need of Encapsulations, Attributes, default attributes, static attributes, static methods, initializing objects, Pass by reference, self. Relational-ships: Introduction, Aggregation, Dependency. Inheritance: Need of Inheritance, Overriding, Super, Types of Inheritance. Abstract Class, methods.	Experiments	15
Unit -5	(Web Programming) Introduction, Creating Simple Web Client, Advanced Web Clients, CGI, Building CGI Applications.	PBL	20

S.NO.	Practical List
1	Program to count the number of each vowel in a string.
2	Program to Find Sum of Natural Numbers Using Recursion.
3	Program To Display Powers of 2 Using Anonymous Function.
4	Program to Accept Three Digits and Print all Possible Combinations from the Digits.
5	Program to Find the Sum of the Series: 1 + x^2/2 + x^3/3 + … x^n/n.
6	Program to Create a List of Tuples with the First Element as the Number and Second Ele as the Square of the Number.
7	Program to Count the Frequency of Words Appearing in a String Using a Dictionary.
8	Program to Remove the Duplicate Items from a List.
9	Program that Displays which Letters are in the First String but not in the Second
10	ARS Gems Store sells different varieties of gems to its customers. Write a Python progra calculate the bill amount to be paid by a customer based on the list of gems and quantity purchased. Any purchase with a total bill amount above Rs.30000 is entitled for 5% disco If any gem required by the customer is not available in the store, then consider total bill amount to be -1. Assume that quantity required by the customer for any gem will always b greater than 0. Perform case-sensitive comparison wherever applicable. Hours
11	Given a list of integer values. Write a python program to check whether it contains same number in adjacent position. Display the count of such adjacent occurrences. 1.0 Hours

Sample Input	Expected Output
[1,1,5,100,-20,-20,6,0,0]	3
[10,20,30,40,30,20]	0
[1,2,2,3,4,4,4,10]	3

12	Program to Count the Occurrences of a Word in a Text File.
13	Program to Read a File and Capitalize the First Letter of Every Word in the File.
14	Program to Create a Class which Performs Basic Calculator Operations

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Wesley J. Chun;; Core Python Programming Prentice Hall.
Articles	
References Books	Megnus Lie Hetland Beginning Python from Novice to Professional Apress. Mark Lutz Programming Python rd 2 Edition, O'Reilly Media, Inc Dusty Philips Python 3 Object Oriented Programming Packt Publishing; July 2019 Steve Holden and David Beazley Python Web Programming New Riders
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	1	2	1	2	2	2	-	-	-	2	-	-	1	2	3
CO3	2	2	1	-	1	-	-	-	-	-	-	-	3	3	3
CO4	2	2	-	3	1	-	-	-	-	-	-	-	3	2	3
CO5	2	2	-	2	1	-	-	-	-	-	-	-	2	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

MCA

Title of the Course	Android based Application Development
Course Code	MCA 106-B(P)

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					0	0	3	3
Course Type	Lab only							
Course Category	Discipline Electives							
Pre-Requisite/s	Having the exposure about the object-oriented programming.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various syntax rules of the programming language such as java and XML**(BL1-Remember)** **CO2-** To understand Object Oriented concepts for Android and various mobile application development concepts including interface designing, handling multiple activities**(BL2-Understand)** **CO3-** To implement XML, Java and mysql for database connectivity and file system**(BL3-Apply)** **CO4-** To analyze various widgets and learn to use them as per the problem**(BL4-Analyze)** **CO5-** To develop solutions for real world problems using android application development**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG4(Quality education) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	Getting Started with Android - Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file	whiteboard/PPT, Recorded video/interactive videos	08
2	Android Application Design Essentials - Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions. Activity States and Life Cycle. XML : Tage, Namespaces.	whiteboard/PPT, Recorded video/interactive videos	10
3	Building Blocks of Mobile Apps - Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.	whiteboard/PPT, Recorded video/interactive videos	9
4	Shared Preferences, Mobile Databases such as SQLite, Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.	whiteboard/PPT, Recorded video/interactive videos	08
5	Using Common Android APIs: Using Android Data and Storage APIs, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.	whiteboard/PPT, Recorded video/interactive videos	08

Part C

Project Based Learning on Andriod Based Application Development

1. Develop an application that uses components, Font and Colors.
2. Develop a native calculator application.
3. Develop an application that uses layout managers and events managers.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that creates an alert upon receiving a message
6. Develop an application that makes use of database.
7. Implement an application that implements multi-threading.
8. Develop a native application that uses GPS location information
9. Create a mobile application that creates alarm clock.
10. Create an application that makes use of Explicit and implicit intents.

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	30	40	20

Part E

Books	Lauren Darcey and Shane Conder, Android Wireless Application Development,Pearson Education, 2nd ed. (2011)
Articles	B.M.Harwani Android Programming Unleashed Pearson Education Inc 2013
References Books	Charlie Collins, Michael D.Galpin, Matthias Kappler,Android in Practice,DreamTech Press 2016
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	1	1	-	-	-	-	-	-	-	1	2	3
CO2	-	2	-	2	2	-	-	-	-	-	-	-	2	1	-
CO3	-	2	1	-	1	-	-	-	-	-	-	-	1	2	1
CO4	1	2	-	1	2	-	-	-	-	-	-	-	2	3	-
CO5	-	1	2	-	-	-	-	-	-	-	-	-	1	2	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Evaluation of Industrial Training -1
Course Code	CED0301[P]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s	subject knowledge of first and second semester .			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the 'real' working environment and get acquainted with the organization structure, business operations and administrative functions**(BL2-Understand)** **CO2-** To have hands-on experience in the students' related field so that they can relate and reinforce what has been taught at the university**(BL2-Understand)** **CO3-** To promote cooperation and to develop synergetic collaboration between industry and the university in promoting a knowledgeable society**(BL3-Apply)** **CO4-** Develop the confidence require for group living and sharing of responsibilities of acquire leader ship qualities and democratic attitudes. **(BL4-Analyze)** **CO5-** Develop the capacity to meet emergencies and natural disasters and practice national integration and social harmony**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✓ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	Students have to submit a report on training and give a presentation on his/her experience	Presentation	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Industrial training has its own importance in a career of a student who is pursuing a professional degree. It is considered as a part of college curriculum. The objective of an industrial training is to provide us an insight regarding internal working of companies. We understand that theoretical knowledge is not enough for a successful professional career. With an aim to go beyond academics, industrial visit provides students a practical perspective of the work place. Industrial trainings provide an opportunity to learn practically through interaction, working methods and employment practices.	Field work	BL3-Apply	40 hrs
Module-II	It gives students an exposure to current work practices as opposed to possibly theoretical knowledge being taught at college. Industrial visits provide an excellent opportunity to interact with industries and know more about industrial environment. Industrial trainings are arranged by TAP cell with an objective of providing us an opportunity to explore different sectors like IT, Manufacturing services, finance and marketing. Industrial visit helps to combine theoretical knowledge with practical knowledge. Industrial realities are opened to the students through industrial visits/trainings.	Field work	BL4-Analyze	40 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	0	1	0	2	1	3	2	3	2	0	2	1	1	2
CO2	2	1	0	0	2	1	2	3	3	2	1	2	2	1	1
CO3	2	1	0	0	2	1	3	3	2	2	0	2	2	2	1
CO4	2	0	1	0	2	0	3	2	2	2	0	2	1	2	1
CO5	2	1	0	0	2	1	3	3	3	2	0	2	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Industrial Training
Course Code	CED0501[P]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s	Basic Knowledge of Civil Engineering			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the 'real' working environment and get acquainted with the organization structure, business operations and administrative functions**(BL2-Understand)** **CO2-** To have hands-on experience in the students' related field so that they can relate and reinforce what has been taught at the university**(BL2-Understand)** **CO3-** To promote cooperation and to develop synergetic collaboration between industry and the university in promoting a knowledgeable society**(BL3-Apply)** **CO4-** Develop the confidence require for group living and sharing of responsibilities of acquire leader ship qualities and democratic attitudes. **(BL4-Analyze)** **CO5-** Develop the capacity to meet emergencies and natural disasters and practice national integration and social harmony**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✓ Environment ✕		**SDG (Goals)**	SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Students have to submit a report on training and give a presentation on his/her experience	Presentation	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Industrial training has its own importance in a career of a student who is pursuing a professional degree. It is considered as a part of college curriculum. The objective of an industrial training is to provide us an insight regarding internal working of companies. We understand that theoretical knowledge is not enough for a successful professional career. With an aim to go beyond academics, industrial visit provides students a practical perspective of the work place. Industrial trainings provide an opportunity to learn practically through interaction, working methods and employment practices.	Field work	BL3-Apply	40 hrs
Module-II	It gives students an exposure to current work practices as opposed to possibly theoretical knowledge being taught at college. Industrial visits provide an excellent opportunity to interact with industries and know more about industrial environment. Industrial trainings are arranged by TAP cell with an objective of providing us an opportunity to explore different sectors like IT, Manufacturing services, finance and marketing. Industrial visit helps to combine theoretical knowledge with practical knowledge. Industrial realities are opened to the students through industrial visits/trainings.	Field work	BL4-Analyze	40 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	0	1	0	2	1	3	2	3	2	0	2	1	1	2
CO2	2	1	0	0	2	1	2	3	3	2	1	2	2	1	1
CO3	2	1	0	0	2	1	3	3	2	2	0	2	2	2	1
CO4	2	0	1	0	2	0	3	2	2	2	0	2	1	2	1
CO5	2	1	0	0	2	1	3	3	3	2	0	2	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Minor Project
Course Code	CED0601[P]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Project							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of Civil engineering and interdisciplinary subjects.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To enhance writing skills and knowledge. **(BL2-Understand)** **CO2-** To increase their mental ability.**(BL3-Apply)** **CO3-** To inculcate the ability to express innovative opinion and thoughts**(BL4-Analyze)** **CO4-** To have Dissertation works as skills development in students.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Project/Problem Identification	Project Work	8
2	Project Analysis, Requirement Gathering	Project Work	8
3	Implementation of Project/Solution	Project Work	8
4	Testing and Verification	Project Work	8
5	Presentation and Report Writing	Project Work	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Identification of a problem and formulation of a topic of project/thesis	PBL	BL3-Apply	15 hrs
Module-III	Dissertation and Viva-voci	PBL	BL5-Evaluate	20 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	2	1	1	1	-	-	-	-	-	-	-	-
CO2	1	1	1	1	1	2	2	1	-	-	-	-	-	-	-
CO3	1	1	1	2	1	2	1	2	-	-	-	-	-	-	-
CO4	1	1	1	1	1	2	1	2	-	-	-	-	-	-	-
CO5	1	1	1	2	1	2	1	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Industrial training
Course Code	CED0702[P]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s	Basic Knowledge of Civil Engineering			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the 'real' working environment and get acquainted with the organization structure, business operations and administrative functions**(BL2-Understand)** **CO2-** To have hands-on experience in the students' related field so that they can relate and reinforce what has been taught at the university**(BL2-Understand)** **CO3-** To promote cooperation and to develop synergetic collaboration between industry and the university in promoting a knowledgeable society**(BL3-Apply)** **CO4-** Develop the confidence require for group living and sharing of responsibilities of acquire leader ship qualities and democratic attitudes. **(BL4-Analyze)** **CO5-** Develop the capacity to meet emergencies and natural disasters and practice national integration and social harmony**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✓ Environment ✕		**SDG (Goals)**	SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Students have to submit a report on training and give a presentation on his/her experience	Presentation	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Industrial training has its own importance in a career of a student who is pursuing a professional degree. It is considered as a part of college curriculum. The objective of an industrial training is to provide us an insight regarding internal working of companies. We understand that theoretical knowledge is not enough for a successful professional career. With an aim to go beyond academics, industrial visit provides students a practical perspective of the work place. Industrial trainings provide an opportunity to learn practically through interaction, working methods and employment practices.	Field work	BL3-Apply	40 hrs
Module-II	It gives students an exposure to current work practices as opposed to possibly theoretical knowledge being taught at college. Industrial visits provide an excellent opportunity to interact with industries and know more about industrial environment. Industrial trainings are arranged by TAP cell with an objective of providing us an opportunity to explore different sectors like IT, Manufacturing services, finance and marketing. Industrial visit helps to combine theoretical knowledge with practical knowledge. Industrial realities are opened to the students through industrial visits/trainings.	Field work	BL4-Analyze	40 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	0	1	0	2	1	3	2	3	2	0	2	1	1	2
CO2	2	1	0	0	2	1	2	3	3	2	1	2	2	1	1
CO3	2	1	0	0	2	1	3	3	2	2	0	2	2	2	1
CO4	2	0	1	0	2	0	3	2	2	2	0	2	1	2	1
CO5	2	1	0	0	3	2	3	3	3	2	1	2	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Major Project (Planning and Literature Survey)
Course Code	CED0703[P]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Project							
Course Category	Projects and Internship							
Pre-Requisite/s	Knowledge of Civil engineering and interdisciplinary subjects.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To enhance writing skills and knowledge.**(BL2-Understand)** **CO2-** To increase their mental ability.**(BL3-Apply)** **CO3-** To inculcate the ability to express innovative opinion and thoughts**(BL4-Analyze)** **CO4-** To have Dissertation works as skills development in students.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Project/Problem Identification	Project Work	8
2	Project Analysis, Requirement Gathering	Project Work	8
3	Writing of Literature Review	Project Work	8
4	Findings of Research Gap	Project Work	8
5	Presentation and Report Writing	Project Work	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Identification of a problem and formulation of a topic of project/thesis	PBL	BL3-Apply	15 hrs
Module-III	Dissertation and Viva-voci	PBL	BL5-Evaluate	20 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	0	0	0	2	1	3	3	3	2	0	2	1	1	2
CO2	2	0	1	0	1	0	2	2	3	2	0	2	2	2	1
CO3	1	1	0	0	2	1	3	3	3	2	0	1	1	1	1
CO4	2	1	1	0	1	1	3	2	2	2	0	2	1	1	2
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Major Project
Course Code	CED0804[P]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					0	0	8	8
Course Type	Project							
Course Category	Projects and Internship							
Pre-Requisite/s	Knowledge of Civil engineering and interdisciplinary subjects.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To enhance writing skills and knowledge.**(BL2-Understand)** **CO2-** To increase their mental ability.**(BL3-Apply)** **CO3-** To inculcate the ability to express innovative opinion and thoughts**(BL4-Analyze)** **CO4-** To have Dissertation works as skills development in students.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Project/Problem Identification	Project Work	8
2	Project Analysis, Requirement Gathering	Project Work	8
3	Implementation of Project/Solution	Project Work	8
4	Testing and Verification	Project Work	8
5	Presentation and Report Writing	Project Work	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Identification of a problem and formulation of a topic of project/thesis	PBL	BL3-Apply	15 hrs
Module-III	Dissertation and Viva-voci	PBL	BL5-Evaluate	20 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	0	0	0	2	1	3	3	3	2	0	2	1	1	2
CO2	2	0	1	0	1	0	2	2	3	2	0	2	2	2	1
CO3	1	1	0	0	1	2	3	3	3	2	0	1	1	1	1
CO4	2	1	1	0	1	1	3	2	2	2	0	2	1	1	2
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Geo-synthetics and Reinforced Soil Structures
Course Code	CEE0602[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Identify the type of Geosynthetic and their relevance**(BL2-Understand)** **CO2-** Analyze &compute different properties of Geosynthetics**(BL4-Analyze)** **CO3-** Understand the emerging trends of Geosynthetic in geotechnical applications**(BL2-Understand)** **CO4-** Design the Reinforced Earth Walls using Geosynthetic material**(BL5-Evaluate)** **CO5-** Design the Reinforced Foundation using Geosynthetic materials**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Students will use different materials for soil stabilization	PBL	BL4-Analyze	15
2	Incresing the compressive strength of soil with different fibres	PBL	BL4-Analyze	15

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Koerner, R.M. "Designing with Geosynthetics", Prentice Hall, New Jersey, USA, 4thedition, 1999 Jewell, R.A., "Soil Reinforcement with Geotextiles", Special Publication No. 123,CIRIA, Thomas Telford. London, UK, 1996
Articles	https://www.researchgate.net/publication/330788128_A_Study_on_Geosynthetics_Material_in_soil_Reinforcement
References Books	Geosynthetics - New Horizons, Eds. G.V. Rao, PK Banerjee, J.T. Shahu, G.V. Ramana,Asian Books Private Ltd., New Delhi, 2004
MOOC Courses	https://archive.nptel.ac.in/courses/105/106/105106052/
Videos	https://www.youtube.com/watch?v=7Im_fxGLUmk&t=1s

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	-	-	-	-	-	-	2	2	3	2	2
CO2	3	2	2	2	-	-	-	-	-	-	2	2	2	2	2
CO3	3	2	2	1	-	-	-	-	-	-	2	1	3	3	3
CO4	3	2	1	1	-	-	-	-	-	-	2	1	2	2	2
CO5	3	2	2	1	-	-	-	-	-	-	1	2	2	2	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Introduction to Finite Element Analysis
Course Code	CEE0603[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the fundamental concepts of finite element method to solve engineering problems**(BL2-Understand)** **CO2-** Formulate finite element models using appropriate element selection, development ofstiffness & force matrices, and application of boundary conditions**(BL3-Apply)** **CO3-** Solve structural, thermal, and dynamic problems using the developed finite element formulations**(BL4-Analyze)** **CO4-** Demonstrate the ability to create models for structural, thermal, and fluid flow applications using commercial finite element packages**(BL3-Apply)** **CO5-** Interpret the analysis results to improve product and system design**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Comparative study of different properties of materials	PBL	BL3-Apply	15

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Rao, S.S., “The Finite Element Method in Engineering”, 6/e, Butterworth-Heinemann Publisher, 2018
Articles	Reddy J.N, “An Introduction to Finite Element Method”, McGraw-Hill International Education, 3/e., 2005
References Books	Chandrupatla, T.R., and Belegundu, A.D., “Introduction to Finite Element in Engineering”, 4/e, Prentice Hall of India Pvt. Ltd.’, New Delhi, 2012
MOOC Courses	https://www.amrita.edu/course/introduction-to-finite-element-method/
Videos	https://www.youtube.com/watch?v=2iUnfPRk6Ro

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	2	-	-	-	-	-	-	-	3	3	1	2
CO2	3	1	2	1	-	-	-	-	-	-	-	1	3	1	1
CO3	3	1	3	1	2	-	-	-	2	-	-	1	3	2	1
CO4	3	2	2	2	2	-	-	-	2	-	-	2	3	1	1
CO5	3	3	3	3	3	-	-	-	3	-	-	3	3	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Smart Cities
Course Code	CEE0604[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Students will Acquaint knowledge on smart cities planning and development**(BL2-Understand)** **CO2-** Develop work break down structure, scheduling and project management of smart cities**(BL3-Apply)** **CO3-** Work out the most energy efficient technique for development of Smart Cities**(BL4-Analyze)** **CO4-** To understand the importance of different smart system**(BL2-Understand)** **CO5-** To understand latest technologies used in intelligent building**(BL2-Understand)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to Smart cities: Introduction to city planning Concept, Principle stakeholders, key trends in smart cities developments	Lectures with Presentation, Seminars	10
2	Smart Cities Planning and Development: Understanding smart cities, Dimension of smart cities, Global Standards and performance benchmarks, Practice codes, Smart city planning and development	Lectures with Presentation, Seminars	10
3	Financing smart cities development, Governance of smart cities	Lectures with Presentation, Seminars	6
4	Project management in Smart Cities: Phases, Stages of project and work break down Structure, Project organization structure, Planning, Scheduling and CPM, Project cost analysis, resource allocation & leveling, Line of balancing technique, Project monitoring and control, Project risk management	Lectures with Presentation, Seminars	8
5	Green building in smart cities: Introduction to green buildings, Rating system, Energy saving system	Lectures with Presentation, Seminars	6

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Smart material associated with smart building	PBL	BL4-Analyze	8
2	Technology involved in different construction of smart building	PBL	BL3-Apply	8
3	Model preparation on smart city	PBL	BL4-Analyze	8
4	Case study on ITS.	Case Study	BL3-Apply	10
5	Case study on smart city	Case Study	BL3-Apply	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Jo Beall (1997); “A city for all: valuing differences and working with diversity”; Zed books limited, London (ISBN: 1-85649-477-2)
Articles	(http://indiansmartcities.in/downloads/CONCEPT_NOTE_-3.12.2014__REVISED_AND_LATEST_.pdf)
References Books	William J. V. Neill (2004); “Urban Planning and cultural identity”; Routledge, London (ISBN: 0- 415-19747-3)
MOOC Courses	https://archive.nptel.ac.in/courses/105/105/105105160/
Videos	https://www.youtube.com/watch?v=qX516jcwCKE

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	1	1	1	-	-	-	1	1	2	1	2
CO2	3	2	1	2	1	2	1	-	-	-	1	2	2	2	3
CO3	3	2	2	1	1	2	1	-	-	-	2	1	3	2	2
CO4	2	2	2	2	1	2	1	-	-	-	1	1	3	1	1
CO5	2	2	1	1	3	1	1	-	-	-	1	1	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Pavement Design
Course Code	CEE0703[T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Systematically generate and compile required data's for design of pavement (Highway & Airfield)**(BL3-Apply)** **CO2-** Analyze stress, strain and deflection by boussinesq's, bur mister's and westergaard's theory**(BL4-Analyze)** **CO3-** Design rigid pavement and flexible pavement conforming to IRC58-2002 and IRC37-2001.**(BL4-Analyze)** **CO4-** Evaluate the performance of the pavement and also develops maintenance statement based on site specific requirements**(BL5-Evaluate)** **CO5-** Understand the various causes leading to failure of pavement and remedies for the same**(BL2-Understand)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction: Desirable characteristics of pavement, Types and components, Difference between Highway pavement and Air field pavement, Design strategies of variables, Functions of subgrade, sub base, Base course, surface course, comparison between Rigid and flexible pavement Fundamentals of Design of Pavements: Stresses and deflections, Principle, Assumptions and Limitations of Boussinesq's theory, Burmister theory and problems	Lectures with Presentation, Site Visit to Highway Construction site	8
2	Design Factors: Design wheel load, contact pressure, Design life, Traffic factors, climatic factors, Road geometry, Subgrade strength and drainage, ESWL concept Determination of ESWL by equivalent deflection criteria, Stress criteria, EWL concept, and problems on above. Flexible pavement Design: Assumptions, Mcleod Method, Kansas method, CBR method, IRC Method (old), CSA method using IRC-37-2001	Lectures with Presentation, Site Visit to Highway Construction site	8
3	Flexible Pavement Failures, Maintenance and Evaluation: Types of failures, Causes, Remedial/Maintenance measures in flexible pavements, Functional Evaluation by Visual inspection and unevenness measurements, Structural evaluation by Benkleman beam deflection method, Falling weight deflecto meter, GPR method. Design factors for runway pavements, Design methods for Airfield pavement	Lectures with Presentation, Site Visit to Highway Construction site	8
4	Stresses in Rigid Pavement : Types of stress, Analysis of Stresses, Westergaard's Analysis, Modified Westergaard equations, Critical stresses, Wheel load stresses, Warping stress, Frictional stress, combined stresses (using chart / equations), problems on above. Design of Rigid Pavement: Design of CC pavement by IRC: 58-2002 for dual and Tandem axle load, Reinforcement in slabs, Design of Dowel bars, Design of Tie bars, Design factors for Runway pavements, Design methods for airfield pavements	Lectures with Presentation, Site Visit to Highway Construction site	8
5	Rigid Pavement Failures, Maintenance and Evaluation: Types of failures, causes, remedial/maintenance measures in rigid pavements, Functional evaluation by Visual inspection and unevenness measurements, wheel load and its repetition, properties of sub grade, properties of concrete. External conditions, joints, Reinforcement, Requirements of joints, Types of joints, Expansion joint, contraction joint, warping joint, construction joint, longitudinal joint, Design of joints	Lectures with Presentation, Site Visit to Highway Construction site	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Students will Collect the data from highway and develop best design	PBL	BL4-Analyze	15 hrs
2	Students will study different types of Pavements that are used in India	Case Study	BL3-Apply	15

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	S K Khanna, C E G Justo, and A Veeraragavan, "Highway Engineering", Nem Chand & Brothers
Articles	https://www.researchgate.net/search.Search.html?query=Pavement-Design&type=publication
References Books	L.R.Kadiyali and Dr.N.B.Lal, " Principles and Practices of Highway Engineering", Khanna publisher
MOOC Courses	https://archive.nptel.ac.in/courses/105/106/105106221/
Videos	https://www.youtube.com/watch?v=fGcgX63pBk4

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1	-	-	-	-	-	-	2	2	2	2	3
CO2	3	2	2	2	-	-	-	-	-	-	2	1	3	3	3
CO3	3	2	3	1	-	-	-	-	-	-	2	2	3	2	2
CO4	3	2	2	1	-	-	-	-	-	-	2	2	3	2	2
CO5	3	2	2	1	-	-	-	-	-	-	1	2	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Fluid Dynamics
Course Code	CEE0706[T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Students will revise the concepts of fluid properties**(BL1-Remember)** **CO2-** Students will understand the concept of fluid kinematics**(BL2-Understand)** **CO3-** Students will analyse the type of boundary layer flows**(BL4-Analyze)** **CO4-** Students will be able to apply the fluid concepts for hydraulic structures**(BL3-Apply)** **CO5-** Students will be able to evaluate different flow conditions with different defined equations**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Basic Concepts and Fundamentals: Definition and properties of Fluids, Fluid as continuum, Langragian and Eulerian description,Velocity and stress field, Fluid statics, Fluid Kinematics Governing Equations of Fluid Motion: Reynolds transport theorem, Integral and differential forms of governing equations: mass, momentum and energy conservation equations, NavierStokes equations,Euler's equation,Bernoulli's Equation	Lectures with Presentation, Seminars	8
2	Exact solutions of Navier-Stokes Equations: Couette flows,Poiseuille flows, Fully developed flows in noncircular cross-sections, Unsteady flows, Creeping flows Potential Flows: Revisit of fluid kinematics,Stream and Velocity potential function, Circulation, Irrotational vortex,Basic plane potential flows: Uniform stream;Source and Sink;Vortex flow, Doublet,Superposition of basic plane potential flows, Flow past a circular cylinder, Magnus effect;Kutta-Joukowski lift theorem; Concept of lift and drag.	Lectures with Presentation, Seminars	8
3	Laminar Boundary Layers: Boundary layer equations, Boundary layer thickness, Boundary layer on a flat plate, similarity solutions, Integral form of boundary layer equations, Approximate Methods, Flow separation,Entry flow into a duct Elements of Stability Theory: Concept of small-disturbance stability, Orr-Sommerfeld equation, Inviscid stability theory,Boundary layer stability, Thermal instability, Transition to turbulence	Lectures with Presentation, Seminars	8
4	Turbulent Flow: Introduction, Fluctuations and timeaveraging, General equations of turbulent flow, Turbulent boundary layer equation, Flat plate turbulent boundary layer, Turbulent pipe flow, Prandtl mixing hypothesis, Turbulence modeling, Free turbulent flows	Lectures with Presentation, Seminars	7
5	Compressible Flows: Speed of sound and Mach number,Basic equations for one dimensional flows, Isentropic relations, Normal-shock wave, Rankine-Hugoniot relations, Fanno and Rayleigh curve, Mach waves, Oblique shock wave,PrandtlMeyer expansion waves, Quasione dimensional flows, Compressible viscous flows, Compressible boundary layers Introduction to Computational Fluid Dynamics (CFD): Boundary conditions,Basic discretization – Finite difference method, Finite volume method and Finite element method	Lectures with Presentation, Seminars	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Performance of real nozzle	Case Study	BL4-Analyze	15
2	Measurements of boundary layer thickness using numerical & analytical solution	PBL	BL4-Analyze	15

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Batchelor G.K,An Introduction to Fluid Dynamics, Cambridge University Press, 1983 Frank M. White, Fluid Mechanics, Tata McGraw-Hill, Singapore,Sixth Edition, 2008
Articles	https://ocw.mit.edu/courses/2-06-fluid-dynamics-spring-2013/pages/syllabus/
References Books	Frank M. White,Viscous Fluid Flow, Third Edition, McGraw-Hill Series of Mechanical Engineering, 2006
MOOC Courses	https://archive.nptel.ac.in/courses/112/106/112106200/
Videos	https://www.youtube.com/watch?v=AirfUsq8aSo&t=160s

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	-	-	-	-	-	-	1	1	1	2	1
CO2	3	2	2	-	-	-	-	-	-	-	1	2	1	1	2
CO3	3	2	2	-	-	-	-	-	-	-	2	1	2	2	1
CO4	3	1	2	-	-	-	-	-	-	-	1	-	1	2	1
CO5	3	2	2	-	-	-	-	-	-	-	-	1	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Wastewater Treatment and Recycling
Course Code	CEE0707[T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Integrated waste management issues, collection, recovery, reuse, recycling, energy-from-waste, and landfilling**(BL3-Apply)** **CO2-** Analyze & compute the challenges of waste management for smart cities**(BL4-Analyze)** **CO3-** Understand the C&D Waste and E-Waste Management**(BL2-Understand)** **CO4-** Design the generation rates and waste composition material**(BL5-Evaluate)** **CO5-** Perform the role of MSW management within the various initiatives of the Govt. of India including: Swachh Bharat Mission, Smart Cities as well as Make in India**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG4(Quality education) SDG6(Clean water and sanitation) SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Important terminologies in waste water treatments systems: Sludge, aerobic treatments, anerobic treatments, bioengineering, biosolids, clarifiers, sewers, wetland, retention time, disinfection, influent, effluent, scum, anaerobic digestion, trickling filter, root zone treatment technology	Lectures with problem based learning, experimental learning, case study,	8
2	Sewage and waste water treatments systems: A. Primary treatment methods B. Secondary treatment methods and C. Tertiary treatment methods	Lectures with problem based learning, experimental learning, case study,	8
3	Biotechnological application of hazardous waste management and management of Resources: Use of microbial systems, Waste water treatment using root zone treatment by plants. Reclamation of wasteland: biomass production for Biogas	Lectures with problem based learning, experimental learning, case study,	7
4	Sludge disposal: Sources and effects of sludge on the environment. Methods of sludge disposal	Lectures with problem based learning, experimental learning, case study,	8
5	Wastewater Recycling: Scope and demands; Types and stages of recycling; Recycling requirements; Designated reuse criteria; centralized vs decentralized recycling systems	Lectures with problem based learning, experimental learning, case study,	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Development of Natural Filters for clean water	PBL	BL5-Evaluate	15 hrs
2	Development of Biogas chamber model	PBL	BL5-Evaluate	15 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	12	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Biotreatment Systems, Volume II ; D.L. Wise Biodegradation and Bioremediation. Academic Press; 2nd edn. Martin Alexander
Articles	https://www.researchgate.net/publication/375376650_The_Treatment_of_Wastewater_Recycling_and_Reuse_-Past_Present_and_in_the_Future
References Books	Gabriel Bitton (Author). Wastewater Microbiology, 2nd Edition. Wiley-Liss; 2nd edition (February 16, 1999).
MOOC Courses	https://onlinecourses.nptel.ac.in/noc21_ce49/preview
Videos	https://www.youtube.com/watch?v=fHRxhuMQQnE

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	2	3	-	-	-	2	2	3	3	3
CO2	3	2	2	-	-	-	3	-	-	-	2	3	2	2	2
CO3	2	2	2	-	-	2	3	-	-	-	3	2	2	2	2
CO4	2	2	3	-	-	1	3	-	-	-	2	3	2	2	2
CO5	3	2	2	-	-	2	3	-	-	-	2	3	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Sustainable Construction Methods
Course Code	CEE0708[T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Student will be able to Classify the sustainable construction materials**(BL2-Understand)** **CO2-** Student will be able to Apply cutting-edge construction technologies**(BL3-Apply)** **CO3-** Student will be able to Evaluate different sustainable construction methods**(BL5-Evaluate)** **CO4-** Student will be able to Apply different rating systems of construction/buildings as a professional**(BL3-Apply)** **CO5-** Student will be able to Apply life cycle approach to optimize the performance of green construction materials **(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Types of foundations and construction methods. Basics of Formwork and Staging. Common building construction methods (conventional walls and slabs; conventional framed structure with blockwork walls). Modular construction methods for repetitive works	Lectures with problem based learning, experimental learning, case study, field trips	8
2	Precast concrete construction methods. Basics of Slip forming for tall structures. Basic construction methods for steel structures. Basics of construction methods for Bridges	Lectures with problem based learning, experimental learning, case study, field trips	8
3	dentification of cutting-edge sustainable construction materials, technologies, and project management strategies for use in the construction industry and evaluation of their potential to reduce the negative environmental impacts of construction activity	Lectures with problem based learning, experimental learning, case study, field trips	8
4	Study and evaluation of current LEED and GRIHA rating for construction system. Detailed case study and analysis of highly successful recent "green construction projects". Guidance to students for the LEED Green Associate professional licensing examination	Lectures with problem based learning, experimental learning, case study, field trips	8
5	Environmental impact of materials; life-cycle assessment; material selection to optimize performance; design, evaluation, and production of green construction materials	Lectures with problem based learning, experimental learning, case study, field trips	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	12	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Rebecca L. Henn; Andrew J. Hoffman (2013), Constructing Green the Social Structures of Sustainability (Urban and Industrial Environments), MIT Press
Articles	https://www.researchgate.net/publication/358582436_A_Study_on_Sustainable_Construction_Practices_and_Management
References Books	Kim S. Elliott, Precast Concrete Structures – 12 June 2019, CRC Press Taylor and Francis
MOOC Courses	https://archive.nptel.ac.in/courses/105/102/105102195/
Videos	https://www.youtube.com/watch?v=LdHMjhaBWxw

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	1	2	3	-	-	-	1	2	2	2	2
CO2	3	3	2	-	1	1	1	-	-	-	1	2	2	3	2
CO3	2	2	2	-	-	2	2	-	-	-	2	2	2	2	3
CO4	2	2	2	-	1	2	1	-	-	-	1	1	3	3	3
CO5	3	3	2	-	1	1	2	-	-	-	1	2	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Building Environment & Services
Course Code	CEE0808[T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Students will learn the importance of durability of civil engineering structures**(BL2-Understand)** **CO2-** Students will be able to detect the defects in foundation, masonry, plastering, Painting, flooring, doors and windows**(BL3-Apply)** **CO3-** Students will be able to provide preventive and remedial measures for Defects**(BL4-Analyze)** **CO4-** Students will be able to locate and place different components like Lifts, electrical panels etc.**(BL4-Analyze)** **CO5-** Students will learn the importance of Need for retrofitting and restoration **(BL2-Understand)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Durability of civil engineering structures: – Importance of durability – Factors affecting durability of buildings – life expectancy of different classes of buildings. Environmental factors that affect the durability of structures – Effect of natural agents (Air, sun, rain, frost and biological agents such as vegetation & insects) – Environmental pollution – Effect of pollution of air, water and soil – Location effect (Marine, Industrial area etc.) – Usage aspects (Structures subjected to dynamical loading & abrasive condition) - Preventive and remedial measures. Role of maintenance in durability and serviceability of buildings: – Necessity of maintenance – Economic aspects of maintenance. Different types of maintenance – Preventive maintenance – Remedial maintenance – Routine maintenance – Pre-monsoon maintenance - Special maintenance – Planning aspects of maintenance	Lectures with Presentation, Video Lectures	8
2	Cracks in buildings – Defects in foundation, masonry, plastering, Painting, flooring, doors and windows, concrete (RCC and PCC) and wooden roof - Corrosion of reinforcement and steel structures – structural damage due to fire - Causes – Preventive and remedial measures Cracks in buildings – Causes - Preventive and remedial measures	Lectures with Presentation, Practical visits to detect cracks and defects in a building	8
3	Causes - Preventive and remedial measures for Defects in foundation, masonry wooden roof concrete (RCC and PCC) Corrosion of reinforcement and steel structures flooring doors and Painting Defects due to fire, Stair case, water supply system, sewage and sullage system, in drainage system and electrical system Building Services Introduction to other building services	Lectures with Presentation, Practical visits to detect cracks and defects in a building	8
4	Lift – Location – RTT – Number of lifts – lift well and shaft – Machine room. Air conditioning system: Types of A/C – Capacity determination – Requirements for an A/C room. Electrical installations: Panel board & Buss bar, rising mains – distribution boards – MCB – ELCB – DP - TP and change over switch switches - Telephone and TV connectivity – Requirements of domestic gas pipeline	Lectures with Presentation, Case Study on different lift locations	8
5	Retrofitting and restoration of building – Need for retrofitting and restoration – Common retrofitting works carried out – Shoring and underpinning – Different methods of retrofitting and restoration – Challenges in retrofitting and restoration works. Deterioration of monumental and historical buildings – Common causes – Preventive measures – Restoration works – Conservation of world heritages	Lectures with Presentation, Practical visits to provide solutions for cracks and defects in a building	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Plan and draw in detail ventilation and air-conditioning for a given building	PBL	BL3-Apply	15
2	Plan movement facilities: Lifts, escalators, ramps etc. for a given public building	PBL	BL3-Apply	15

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	S. Champion :Failures and repair of concrete structures ; John Wiley & Sons
Articles	Philip.H.Perkins: Concrete Structures-repair water proofing and protection; Elsevier Science Ltd
References Books	B.S.Nayak : A book on Maintenance Engineering ; Khanna Publishers
MOOC Courses	https://nptel.ac.in/courses/105107156
Videos	https://www.youtube.com/watch?v=9hfKdUGWQjQ&t=2s

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	1	2	-	-	-	2	2	2	3	3
CO2	3	2	3	2	1	1	2	-	-	-	2	2	2	2	2
CO3	3	2	3	2	-	-	1	-	-	-	2	2	2	3	3
CO4	3	3	3	1	1	-	2	-	-	-	1	2	2	2	2
CO5	3	3	2	2	1	1	2	-	-	-	2	2	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Design of Pre stressed Concrete Structure
Course Code	CEE0809[T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					4	1	0	5
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	basic properties of materials, and steel and Rcc design			**Co-Requisite/s**	basic knowledge of structures			
Course Outcomes & Bloom's Level	**CO1-** Students will remember the WSM Method for RCC and Pre-stressed Structures.**(BL1-Remember)** **CO2-** To understand different types and Methods of Pre-stressing.**(BL2-Understand)** **CO3-** Students will be able to apply the knowledge of Pre-stressing on different RCC Structures.**(BL3-Apply)** **CO4-** To analyze Beam for different Profiles of Tendons.**(BL4-Analyze)** **CO5-** To evaluate the stress distribution for different zones of beams**(BL5-Evaluate)** **CO6-** To Create and design a Pre-stressed beam and understand its advantages over RCC**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
unit 1	Introduction, Principles of prestressing, Different methods of prestressing – post tensioning and pre-tensioning. Prestressed concrete materials. Need for high strength concrete and High concrete tensile steel. Creep and shrinkage of concrete, relaxation of steel. Losses of prestress friction and anchorage of steel	Lectures with problem based learning, experimental learning, case study, field trips	10
unit II	Introduction , assumption in plastic analysis Safe moment ,yield moment , plastic moment, shape factor, load factor, moment curvature relationship , collapse load for standard cases, plastic hing length	Lectures with problem based learning, experimental learning, case study, field trips	9
unit III	Stress-pattern in anchorage zones. Transmission length. End zone reinforcement. Stress distribution in end block	Lectures with problem based learning, experimental learning, case study, field trips	8
unit IV	Plastic design of columns for different condition	Lectures with problem based learning, experimental learning, case study, field trips	10
unit V	Design of R.C.C structures concepts (W.S.M)	Lectures with problem based learning, experimental learning, case study, field trips	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	making model of prestressed beam	PBL	BL4-Analyze	3
II	making a model of prestressed slabs	PBL	BL5-Evaluate	2
III	making of model of prestressed coloums	PBL	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	Prestress concrete by S S Ramamrutham
Articles	https://railtec.illinois.edu/wp/wp-content/uploads/Nawy-2009-Prestressed-Concrete.pdf
References Books	Prestress concrete by Krishna Raju
MOOC Courses	https://archive.nptel.ac.in/courses/105/106/105106118/
Videos	https://easyengineering.net/design-of-reinforced-concrete-structures-by-ramamrutham/

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	2	3	1	1	2	-	-	-	-	1	1	-
CO2	1	2	1	1	1	-	2	1	-	1	-	-	1	2	-
CO3	2	1	3	1	-	1	-	1	-	-	-	1	-	-	-
CO4	1	1	1	-	1	-	1	-	-	1	-	2	-	1	-
CO5	1	2	1	-	1	-	1	-	-	-	-	1	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Energy Efficient and Green Building
Course Code	CEE0811[T}

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the concept of Green Buildings**(BL2-Understand)** **CO2-** Analyze & compute the energy flow in buildings**(BL4-Analyze)** **CO3-** Understand the energy efficient buildings**(BL2-Understand)** **CO4-** Design the building as per LEED India Rating System**(BL4-Analyze)** **CO5-** Design an Eco-friendly captive power generation**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	What is Green Building, Why to go for Green Building, Benefits of Green Buildings, Green Building Materials and Equipment in India, What are key Requisites for Constructing a Green Building, Important Sustainable features for Green Building	Lectures with Presentation and Seminar	8
2	Indian Green Building Council, Green Building Moment in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities And Benefits: Opportunities of Green Building, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy Saving Approach in Buildings, LEED India Rating System and Energy Efficiency	Lectures with Microsoft Presentation, Poster Presentations and Interactive Video Lectures	8
3	Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximise System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources. Ecofriendly captive power generation for factory, Building requirement	Lectures with Microsoft Presentation, Poster Presentations and Interactive Video Lectures	8
4	Introduction, CII Godrej Green business centre,Design philosophy,Design interventions,Energy modeling, HVAC System design,Chiller selection,pump selection,Selection of cooling towers,Selection of air handing units,Precooling of fresh air,Interior lighting system,Key feature of the building. Eco-friendly captive power generation for factory,Building requirement	Lectures with Microsoft Presentation, Poster Presentations and Interactive Video Lectures	8
5	Handling of non process waste, waste reduction during construction,materials with recycled content,local materials,material reuse,certified wood ,Rapidly renewable building materials and furniture; Indoor Environment Quality And Occupational Health: Air conditioning, Indore air quality, Sick building syndrome, Tobacco smoke control, Minimum fresh air requirements avoid use of asbestos in the building, improved fresh air ventilation, Measure of IAQ, Reasons for poor IAQ, Measures to achieve Acceptable IAQ levels	Lectures with Microsoft Presentation, Poster Presentations and Interactive Video Lectures	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Eco-friendly captive power generation for ITM University any block	PBL	BL4-Analyze	20
2	Preparing Models of Green Buildings	PBL	BL3-Apply	15

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009
Articles	https://www.researchgate.net/publication/322273339_Energy_Consumption_and_Efficiency_in_Green_Buildings#:~:text=The%20study%20consummates%20that%20as,climate%20changes%20over%20greenhouse%20gases.
References Books	Green Building Hand Book by Tomwoolley and Samkimings, 2009
MOOC Courses	https://archive.nptel.ac.in/courses/105/102/105102195/
Videos	https://www.youtube.com/watch?v=LdHMjhaBWxw

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	1	-	1	2	-	-	-	1	2	2	2	3
CO2	3	2	3	1	1	1	2	-	-	-	1	2	2	3	2
CO3	3	2	3	1	1	1	3	-	-	-	2	2	2	2	3
CO4	3	3	3	2	-	1	2	-	-	-	1	2	3	3	3
CO5	3	2	3	1	-	1	3	-	-	-	1	2	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Airport Engineering
Course Code	CEE0812[T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Describe the different components of airport and aircrafts**(BL2-Understand)** **CO2-** Analyse the requirements of an airport layout with respect to international regulations**(BL4-Analyze)** **CO3-** Explain the airport runway design**(BL4-Analyze)** **CO4-** Design Taxiways & Aprons.**(BL3-Apply)** **CO5-** Summarise the concepts of the terminal service facilities**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	AIR TRANSPORTATION Airport terminology, component parts of Aeroplane, Classification and size of airports; Aircraft characteristics. Air traffic control need for ATC, Air traffic control network, Air traffic control aids –enroute aids, landing aids. Airport site location and necessary surveys for site section, airport obstructions.	Lectures with Presentation, Site Visit to Airport	8
2	PLANNING: Airport master plan –FAA recommendations, Regional Planning, ICAO recommendations, Estimation of future airport traffic needs-layout of Air Port	Lectures with Presentation, Site Visit to Airport	8
3	RUNWAYS: Runway orientation – windrose diagram, basic runway length, corrections for elevation, temperature and gradient, runway geometric design, runway pavement design introduction	Lectures with Presentation, Site Visit to Airport	8
4	TAXIWAYS AND APRONS: Loading aprons –holding aprons –Geometric design standards, exit taxiways –optimal location, design, and fillet and separation clearance	Lectures with Presentation, Site Visit to Airport	8
5	OTHER FACILITIES: Lighting, visual airport marking, airport lighting aids. OPERATIONS AND SCHEDULING: Ground transportation facilities; Airport capacity, runway capacity and delays.	Lectures with Presentation, Site Visit to Airport	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Project On Airport Planning and Design	PBL	BL3-Apply	15

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Khanna S.K., Arora M.G., Jain S.S., “Airport Planning & Design”,1st Edition, Nemch and Bros. Roorkee, 2009
Articles	https://www.researchgate.net/publication/228007533_Airport_Engineering_Planning_Design_and_Development_of_21st_Century_Airports_Fourth_Edition
References Books	Robert Horonjeff, Francis Mc Kelvey, William Sproule and Seth Young, “Planning and Design of Airports” 5th Edition, 2010
MOOC Courses	https://archive.nptel.ac.in/courses/105/107/105107123/
Videos	https://www.youtube.com/watch?v=WUq3uN4MDms

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	-	-	-	-	-	2	2	3	3	2
CO2	3	2	3	1	-	-	-	-	-	-	3	2	2	2	3
CO3	3	2	2	1	-	-	-	-	-	-	2	2	3	2	2
CO4	2	2	1	1	-	-	-	-	-	-	2	2	2	2	3
CO5	2	2	3	-	-	-	-	-	-	-	2	3	2	3	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Introduction to Structural Engineering
Course Code	CEL0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	-1	1	3
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Students must know about various elements and basics of materials			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Students will get knowledge of Basic Civil Engineering**(BL1-Remember)** **CO2-** To understand the Soil properties, Building elements, Integeration of Techniques**(BL2-Understand)** **CO3-** Students are able to apply knowledge of surveying in field**(BL3-Apply)** **CO4-** To Analyse the different Plannings of building**(BL4-Analyze)** **CO5-** To evaluate the behavior and Structural failure & constructional issues**(BL4-Analyze)** **CO6-** To Complete Determination of Layouts **(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction of soil, Preliminary definition and relationships, determination of index properties, classification of soils, soil structure and clay mineralogy, bearing capacity, shear strength, different types of foundations, shallow ,pile, well, machine foundation, site investigation and sub soil exploration, advanced measuring instruments	Experimental learning , case study ,field trips	8
2	Introduction of surveying, Principle of surveying, Reconnaissance, types of surveying, different types of map, Methods of linear measurements, Conventional symbols, Area calculation, Traversing and Triangulation	Experimental learning , case study ,field trips	8
3	Drawing of Building Elements, Drawing of various elements of buildings like different types of door, windows, lintels, arches, staircase, floors and roofs, Building Planning, Principles of Layout, Different types of IS codes and its provision, different types of loads	Experimental learning , case study ,field trips	9
4	Introduction, properties, grades, advantage & disadvantages of concrete, Ingredients of concrete, types of cement, aggregates, water, admixtures, Inspection & testing of materials as per Indian Standard Specifications, bricks, types of bond, destructive and non destructive testing of materials.	Experimental learning , case study ,field trips	9
5	Structural integrity, Physical and performance failure, fatigue failures, failure due to defective materials, failure due to manufacturing errors, failure due to natural disasters, Different types of new structural designing software	Experimental learning , case study ,field trips	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Sieve Analysis of Fine Aggregates	Experiments	BL3-Apply	2
2	Sieve Analysis of Course Aggregates	Experiments	BL3-Apply	2
3	To range the chain line of 40 to 60m	Experiments	BL3-Apply	2
4	Reconnaissance Survey for Index Sketch	Experiments	BL3-Apply	2
5	Drawing of Bars in Beams	Experiments	BL2-Understand	2
6	Drawing of Bars in Columns	Experiments	BL2-Understand	2
7	Specific Surface of Aggregate	Experiments	BL3-Apply	2
8	Samplings of Soil	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	30	40	0

Part E

Books	Bhavikatti S.S, Basics Civil Engineering, New Age International Publishers
Articles	
References Books	Bansal R.K, Basic Civil Engineering and Engineering Mechanics, Laxmi Publication
MOOC Courses	https://nptel.ac.in/courses/105106201
Videos	https://www.youtube.com/watch?v=CsKddkqgwVk&list=PLyqSpQzTE6M_SM0Lrnzk2dJFwElh0Ebhu

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	2	1	-	-	-	2	2	-	3	2	2
CO2	2	2	1	-	-	2	-	-	-	1	-	2	2	2	2
CO3	2	1	3	1	2	-	-	-	-	2	-	-	-	2	-
CO4	1	2	2	3	-	1	-	-	1	1	1	2	3	2	-
CO5	2	1	1	-	2	-	1	-	-	2	-	-	1	2	1
CO6	1	1	-	1	1	-	-	-	-	2	2	-	2	-	1

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Structural Materials
Course Code	CEL0233[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	1	2	5
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basics of Civil Engineering			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Students will get knowledge of Basic Structural Materials**(BL1-Remember)** **CO2-** To understand the materials use in Civil Engineering industry**(BL2-Understand)** **CO3-** Students are able to apply the details of Innovative Textures**(BL3-Apply)** **CO4-** To analyse different Admixtures & other adhesives**(BL4-Analyze)** **CO5-** To evaluate the behavior of different Structural materials in different purposes**(BL5-Evaluate)** **CO6-** To Create adequate type of Construction material **(BL6-Create)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

M

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Compressive Strength of Bricks	Experiments	BL2-Understand	2
2	Water absorption of Bricks	Experiments	BL2-Understand	2
3	Initial and Final Setting time of Cement	Experiments	BL3-Apply	2
4	Efflorescence of Bricks	Experiments	BL2-Understand	2
5	Specific Gravity of Aggregate	Experiments	BL3-Apply	2
6	Fineness of Cement	Experiments	BL2-Understand	2
7	Tensile test of TOR Steel	Experiments	BL3-Apply	2
8	Soundness of Cement	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	Rangwala, Engineering Materials, Charotar Publication
Articles	
References Books	S. K, Duggal, Building Materials, New Age Publication
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	1	1	-	2	-	2	2	3	2	2
CO2	3	3	2	2	2	-	1	-	-	-	2	2	3	3	3
CO3	2	2	2	3	1	1	-	-	2	-	-	2	2	2	1
CO4	3	2	3	2	2	-	1	-	-	-	2	1	1	2	2
CO5	2	2	2	3	1	1	-	-	2	1	2	3	1	3	3
CO6	3	2	3	2	2	1	1	-	2	1	3	2	1	1	2

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Concrete Technology
Course Code	CEL0303[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Students must have knowledge of Structural Materials			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the various concepts in theory of Construction materials**(BL1-Remember)** **CO2-** To understand & analyze the different function of ingredients of concrete**(BL2-Understand)** **CO3-** To implement the different designing concrete mix design**(BL3-Apply)** **CO4-** To provide experimental basis, and to enable the students to analyze and test the concrete properties **(BL4-Analyze)** **CO5-** To evaluate the applications of different special types of concrete**(BL5-Evaluate)** **CO6-** To apply the understanding of destructive and non destructive testing of concrete**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Stones: Occurrence, varieties, Characteristics and their testing, uses, quarrying and dressing of stones. Timber: Important timbers, their engineering properties and uses, defects in timber, seasoning and treatment. Brick and Tiles: Manufacturing, characteristics, classification and uses, improved brick from inferior soils. Flooring tiles and other tiles.	lecture with problem based learning, experimental learning, field trips,case study	10
2	Miscellaneous Construction Materials: Use of fly ash in mortars, lime, Fly ash bricks, Stabilized mud blocks, D.P.C. materials, Building materials made by industrial & agricultural wastes, clay products, P.V.C. materials, advance materials for flooring, doors & windows, Aluminum & glass composites.	lecture with problem based learning, experimental learning, field trips,case study	10
3	Concrete: Introduction: classification, properties, grades, advantage & disadvantages of concrete. Ingredients of concrete, manufacturing and types of cement, aggregates, water and admixtures. Properties of Fresh and Hardened Concrete: Workability-Testing of fresh concrete, Compressive & Tensile strength Characteristics of hardened concrete: Shrinkage and Creep of concrete temperature effects, durability,	lecture with problem based learning, experimental learning, field trips,case study	10
4	Design of Concrete Mix: Introduction, Various classical methods of concrete mix design , Mix design using I.S. code method-basic considerations and factors influencing the choice of mix design, acceptance criteria for concrete. Production and Quality Control of Concrete, curing at different temperatures. field control, Inspection & Testing of Concrete	lecture with problem based learning, experimental learning, field trips,case study	8
5	Special Concrete : Brief Introduction of Concreting underwater, hot & cold weather condition, Light weight concrete, Ready mix concrete, Fiber reinforced concrete, Polymer concrete composites, Shotcrete, Rubble concrete, Resin concrete, Heat resistant concrete, Mass concrete, Temperature control of mass concrete.	lecture with problem based learning, experimental learning, field trips,case study	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To determine the water absorption, compressive strength and efflorescent effect of brick	Experiments	BL5-Evaluate	3
2	To determine the normal consistency, initial and final setting time of cement	Experiments	BL4-Analyze	3
3	To determine the soundness of cement	Experiments	BL3-Apply	3
4	To determine the bulking of sand	Experiments	BL3-Apply	3
5	To determine the compressive strength of cement mortar	Experiments	BL5-Evaluate	3
6	To determine the density & water absorption of aggregates	Experiments	BL4-Analyze	3
7	To determine the workability of concrete by slump cone test/ compaction factor test	Experiments	BL4-Analyze	3
8	To determine the compressive strength of concrete cube	Experiments	BL5-Evaluate	3

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	30
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	1. S.C. Rangwala - Engineering Materials. , 2. Varshney RS - Concrete Technology; Oxford& IBH publishing co. 3. M S Shetty - Concrete Technology.
Articles	https://civiltechnicalguruji.wordpress.com/wp-content/uploads/2018/07/advanced-concrete-technology-zongjin-li.pdf
References Books	M S Shetty - Concrete Technology.
MOOC Courses	https://archive.nptel.ac.in/courses/105/102/105102012/
Videos	https://civiltechnicalguruji.wordpress.com/wp-content/uploads/2018/07/advanced-concrete-technology-zongjin-li.pdf

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1	-	-	-	-	-	2	2	3	3	2	2
CO2	3	2	2	1	-	-	-	-	-	2	2	2	2	3	2
CO3	3	3	2	2	-	-	-	-	-	1	3	2	2	3	2
CO4	3	2	3	2	2	-	-	-	1	2	2	3	3	2	2
CO5	3	3	2	2	2	-	-	-	2	2	3	2	3	3	3
CO6	3	2	3	3	-	-	-	-	1	1	2	3	3	2	2

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Highway and Traffic Engineering
Course Code	CEL0313[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basics of Materials			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Students will be able to get Awareness about the road planning & Traffic problems of the country.**(BL1-Remember)** **CO2-** To introduce the knowledge of Highway Planning**(BL1-Remember)** **CO3-** Students are able to have knowledge of Highway Planning, Alignment, Construction & maintenance of roads**(BL2-Understand)** **CO4-** To knowledge of Traffic Jamming & its solutions on Highways & Minimize The numbers of road accidents**(BL2-Understand)** **CO5-** To design Highways**(BL3-Apply)** **CO6-** To be able to construct roads**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG3(Good health and well-being) SDG4(Quality education) SDG5(Gender equality) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG10(Reduced inequalities) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production) SDG13(Climate action) SDG14(Life below water) SDG15(Life on land) SDG17(Partnerships for the goals)				

Part B

Modules	Contents	Pedagogy	Hours
1	High way planning, Alignment & Geometric Design: Principles of highway planning, road planning in India and financing of roads, classification patterns. Requirements, Engg. Surveys for highway location.	Experimental learning , case study ,field trips,problem based learning	10
2	Cross sectional elements- width, camber, super-elevation, sight distances, extra widening at curves, horizontal and vertical curves, numerical problems.	Experimental learning , case study ,field trips,problem based learning	10
3	Bituminous & Cement Concrete Payments: Design of flexible pavements, Design of Rigid pavements using IRC charts WBM, , surface dressing, interfacial treatment- seal coat, tack coat, prime coat, wearing coats, grouted macadam, bituminous concrete specification, construction and maintenance. Advantages and disadvantages of rigid pavements, general principles of design, types, construction, maintenance and joints, dowel bars, tie bars	Experimental learning , case study ,field trips,problem based learning	8
4	Low Cost Roads, Drainage of Road and testing: Principles of stabilization, mechanical stabilization, requirements, advantages, disadvantages and uses, quality control, macadam roads-types, specifications, construction, maintenance and causes of failures, highway materials, properties and testing, Channelized and unchannelised intersections, at grade & grade separated intersections, description, rotary-design elements, advantages and disadvantages. Evaluation and maintainance of pavements.	Experimental learning , case study ,field trips,problem based learning	9
5	Traffic Characteristics: road user's Characteristics-general human characteristics, physical, mental and emotional factors, factor affecting reaction time, PIEV theory, vehicular characteristics: characteristics affecting road design width, height, length, and other dimensions. Weight, power, speed and breaking capacity of a vehicle. Traffic studies: - spot speed studies and volume studies, speed and delay studies purpose, causes of delay, method of conducting speed and delay studies. Origin and destination studies: various method, collection and interpretation of data. Traffic capacity studies: volume, density, Mass transportation.	Experimental learning , case study ,field trips,problem based learning	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	CBR Test	Experiments	BL3-Apply	2
2	Abrasion Test	Experiments	BL3-Apply	2
3	Impact Test	Experiments	BL4-Analyze	2
4	Specific Gravity Test	Experiments	BL2-Understand	2
5	Bitumen Adhesion	Experiments	BL4-Analyze	2
6	Penetration Test	Experiments	BL3-Apply	2
7	Viscosity Test	Experiments	BL4-Analyze	2
8	Ductility Test	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	

Part E

Books	Khanna S. K. , Justo C. E. G. Highway & Traffic Engineering, Nem Chand Publishers
Articles	https://www.google.co.in/books/edition/Highway_Engineering/86QEEAAAQBAJ?hl=en&gbpv=1&dq=justo+khanna&printsec=frontcover
References Books	Kadiyali L.R, Highway Engineering, Khanna Publications
MOOC Courses	https://nptel.ac.in/courses/105105107
Videos	https://www.youtube.com/watch?v=k117-foOK_Y&list=PLk7ptZcl9vmgQsUoS5XcIIoFVi383V6E9

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	2	3	-	2	3	2	2
CO2	3	2	2	2	-	-	-	-	2	-	-	-	3	2	2
CO3	2	3	1	1	-	-	-	-	1	2	1	-	2	2	2
CO4	2	3	2	1	-	-	-	-	-	-	-	2	2	3	2
CO5	3	2	2	2	-	-	-	-	2	2	-	-	3	3	2
CO6	3	2	2	3	1	-	-	-	-	2	-	1	3	1	1

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Elementary design of structures (RCC)
Course Code	CEL0331[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basics of Materials Properties and Knowledge of Mechanics			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Students will be able to get knowledge about Structural Members**(BL1-Remember)** **CO2-** To introduce the knowledge of Beams and Slab Designs**(BL2-Understand)** **CO3-** Students are able to understand yield Line theory of Slabs**(BL2-Understand)** **CO4-** To analyze the concept of Soft Storey**(BL4-Analyze)** **CO5-** To Apply Codal Provision in designing methods**(BL3-Apply)** **CO6-** To be able to create different basic elements of a building**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Basic Principles of Structural Design : Assumptions, Mechanism of load transfer, Various properties of concrete and reinforcing steel, Introduction to working stress method and limit state methods of design, partial safety factor for load and material.	Experimental learning , case study ,field trips,problem based learning	10
2	Design of Beams: Singly & Doubly reinforced sections	Experimental learning , case study ,field trips,problem based learning	8
3	Design of Slabs: One way slab, Two way slab, Yield line theory	Experimental learning , case study ,field trips,problem based learning	8
4	Concept of Soft Storey: Mechanism of load transfer in soft storey, Stiffness and Stability criteria, Design problems	Experimental learning , case study ,field trips,problem based learning	8
5	Design and drawing details of the various RCC structures, Discussion of Codal provisions of IS 456-2000, SP-16.	Experimental learning , case study ,field trips,problem based learning	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Patterns of Reinforcements in Beams	Experiments	BL3-Apply	2
2	Patterns of Reinforcements in Columns	Experiments	BL3-Apply	2
3	Patterns of Reinforcements in Slabs	Experiments	BL3-Apply	2
4	Types of Beams	Experiments	BL2-Understand	2
5	Types of Columns	Experiments	BL2-Understand	2
6	Types of Slab	Experiments	BL2-Understand	2
7	Drawings of Beams in AutoCad	Experiments	BL4-Analyze	2
8	Drawings of Columns in AutoCad	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	

Part E

Books	1. B.C. Punmia Ashok Kumar Jain, RCC Designs, Laxmi Publication 2. A.K. Jain, Reinforced Concrete: Limit State Design, Nem Chand & Brothers
Articles	https://www.google.co.in/books/edition/Reinforced_Concrete_Structures_Vol_I/6g1fu4pRDCkC?hl=en&gbpv=1&dq=design+of+rcc+structures&printsec=frontcover
References Books	N.Krishnaraju, Design of R.C structures, CBS Publishers and distributors
MOOC Courses	https://nptel.ac.in/courses/105105104
Videos	https://www.youtube.com/watch?v=x2_W127EFrU&list=PLH1Yxo6h9TZk49Yx84lbpJeYfe87Kt69l

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	3	3	-	-	2	3	2
CO2	1	-	1	1	1	2	-	-	2	3	-	-	3	2	2
CO3	-	-	2	1	-	-	-	-	2	1	-	-	3	2	2
CO4	-	-	2	3	1	-	-	-	-	-	-	-	3	2	2
CO5	-	1	-	2	1	-	-	-	-	-	-	-	3	1	2
CO6	-	1	-	2	2	2	-	-	2	-	-	-	2	2	1

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Building Planning and Drawing
Course Code	CEL0333[P]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s	Students must have basic knowledge of Engineering Graphics and Building Elements			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To Remember basic fundamentals of building Design**(BL1-Remember)** **CO2-** To Understand the concept of drawing basic elements of buildings**(BL2-Understand)** **CO3-** To Analyse different techniques for different views of building**(BL4-Analyze)** **CO4-** To apply knowledge of different plans on real life building strutures**(BL3-Apply)** **CO5-** To develop plans of superstructure and substructure details of a building**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Appreciate types of Drawings and its importance, Draw various types of Projections. Use building drawing Symbols, Conventions, and Abbreviations, Apply various types of scales as per needs.	problem based learning, experimental learning,case study	5
2	Apply the Bye-laws and Principles of Planning for residential and other public buildings.	problem based learning, experimental learning,case study	6
3	Develop concept plan of buildings, Prepare detail drawings for single and two storied residential building and public building	problem based learning, experimental learning,case study	8
4	Generate perspective view of simple building by different methods, Develop building models	problem based learning, experimental learning,case study	5
5	Draw details of parts of buildings, provide scope and provisions for building components and services	problem based learning, experimental learning,case study	4

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Interpretation of building drawings approved under local authority	Experiments	BL2-Understand	2
2	Draw symbols , conventions and Abbreviations in sketch book	Experiments	BL2-Understand	2
3	Study of building by-laws act and national building code (NBC)	Experiments	BL3-Apply	2
4	Draw detail plan on drawing sheet - 1 plan ,elevation and section of existing building (actual Measurement Drawing)	Experiments	BL3-Apply	2
5	Draw detail of foundation plan of one room building /two room building in sketch book	Experiments	BL4-Analyze	2
6	Draw working drawings sheet -2 for single storied residential building (bunglow)on 250sq.m plot with scale and show following detail: GF & FF plan with elevation, section and opening schedule	Experiments	BL4-Analyze	2
7	Prepare concept plan of any one other type of building considering local bye laws: high school building, Shopping centre, Hospital and Industrial Building in sketch book.	Experiments	BL4-Analyze	2
8	Develop perspective view of single room residential building with verandah & steps by any methods.	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	0

Part E

Books	R. S. Malek G. S. Meo, Civil Engineering Drawing, New Asian Delhi
Articles	https://www.hitechcaddservices.com/news/types-of-building-drawings/
References Books	B. H. Shukla, Civil Engineering Drawing, Atul Prakashan Ahmedabad
MOOC Courses	https://www.mooc-list.com/course/3d-cad-application-coursera
Videos	https://www.youtube.com/watch?v=abr2elb24Ps&list=PLAhtOl5kcFk2sgnaaZQaTfqEpd3G5iY6B

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	2	2	1	-	-	2	2	2	1	-	-
CO2	1	2	2	2	1	2	2	-	-	-	2	2	3	3	3
CO3	2	1	2	-	-	-	2	2	-	-	-	2	3	-	3
CO4	1	2	2	3	2	-	2	1	-	-	2	2	3	2	2
CO5	1	-	-	1	-	-	1	-	-	-	-	1	-	1	2
CO6	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Building Planning and Drawing
Course Code	CEL0333[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	1	1	5
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s	Students must have basic knowledge of Engineering Graphics and Building Elements			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To Remember basic fundamentals of building Design**(BL1-Remember)** **CO2-** To Understand the concept of drawing basic elements of buildings**(BL2-Understand)** **CO3-** To Analyse different techniques for different views of building**(BL4-Analyze)** **CO4-** To apply knowledge of different plans on real life building strutures**(BL3-Apply)** **CO5-** To develop plans of superstructure and substructure details of a building**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Appreciate types of Drawings and its importance, Draw various types of Projections. Use building drawing Symbols, Conventions, and Abbreviations, Apply various types of scales as per needs.	problem based learning, experimental learning,case study	5
2	Apply the Bye-laws and Principles of Planning for residential and other public buildings.	problem based learning, experimental learning,case study	6
3	Develop concept plan of buildings, Prepare detail drawings for single and two storied residential building and public building	problem based learning, experimental learning,case study	8
4	Generate perspective view of simple building by different methods, Develop building models	problem based learning, experimental learning,case study	5
5	Draw details of parts of buildings, provide scope and provisions for building components and services	problem based learning, experimental learning,case study	4

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Interpretation of building drawings approved under local authority	Experiments	BL2-Understand	2
2	Draw symbols , conventions and Abbreviations in sketch book	Experiments	BL2-Understand	2
3	Study of building by-laws act and national building code (NBC)	Experiments	BL3-Apply	2
4	Draw detail plan on drawing sheet - 1 plan ,elevation and section of existing building (actual Measurement Drawing)	Experiments	BL3-Apply	2
5	Draw detail of foundation plan of one room building /two room building in sketch book	Experiments	BL4-Analyze	2
6	Draw working drawings sheet -2 for single storied residential building (bunglow)on 250sq.m plot with scale and show following detail: GF & FF plan with elevation, section and opening schedule	Experiments	BL4-Analyze	2
7	Prepare concept plan of any one other type of building considering local bye laws: high school building, Shopping centre, Hospital and Industrial Building in sketch book.	Experiments	BL4-Analyze	2
8	Develop perspective view of single room residential building with verandah & steps by any methods.	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	0

Part E

Books	R. S. Malek G. S. Meo, Civil Engineering Drawing, New Asian Delhi
Articles	https://www.hitechcaddservices.com/news/types-of-building-drawings/
References Books	B. H. Shukla, Civil Engineering Drawing, Atul Prakashan Ahmedabad
MOOC Courses	https://www.mooc-list.com/course/3d-cad-application-coursera
Videos	https://www.youtube.com/watch?v=abr2elb24Ps&list=PLAhtOl5kcFk2sgnaaZQaTfqEpd3G5iY6B

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	2	2	1	-	-	2	2	2	1	-	-
CO2	1	2	2	2	1	2	2	-	-	-	2	2	3	3	3
CO3	2	1	2	-	-	-	2	2	-	-	-	2	3	-	3
CO4	1	2	2	3	2	-	2	1	-	-	2	2	3	2	2
CO5	1	-	-	1	-	-	1	-	-	-	-	1	-	1	2
CO6	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Fundamentals of Surveying
Course Code	CEL0407[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	1	2	6
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	subject knowledge of linear measurement, geometry			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** • CO1:To remember the various concepts of surveying.**(BL1-Remember)** **CO2-** • CO2:To understand & analyze the horizontal vertical & inclined measurements.**(BL2-Understand)** **CO3-** • CO3:To implement the different instrumentation techniques.**(BL3-Apply)** **CO4-** • CO4: To provide experimental basis,and to enable the studentstoanalyzetheRLs of different levels.**(BL4-Analyze)** **CO5-** • CO5:To evaluate the land areas & volume of earth work.**(BL5-Evaluate)** **CO6-** • CO6: To apply the understand inglocation of of fininte points **(BL2-Understand)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**						

Part B

Modules	Contents	Pedagogy	Hours
1	Principles and classifications of surveying, chain surveying- basic concepts, terminology and instruments used. Plane table surveying: Principle, methods and equipments, two and three point problems and their solutions Leveling: Principle, terminology and instrumentation, booking of leveling readings, reduction of levels, profile leveling, cross-sectioning and reciprocal leveling. Contouring	Lectures with problem based learning, experimental learning,case study,field trips	10
2	Traversing by Compass: different types of bearings and their measurement systems, Different types of compasses for the measurement of bearings, compass traversing and closing error and its adjustments. Traversing by theodolite, Field work checks, traverse computations, latitude and departures, plotting & adjusting of traverse, omitted measurements.	Lectures with problem based learning, experimental learning,case study,field trips	10
3	Tachometry: Tachometric systems and principles, uses of anallatic lens, tangential system,subtense system, instrument constant, field work reduction, direct-reading tacheometers, use of tacheometry for traversing and contouring. Trigonometrical leveling.	Lectures with problem based learning, experimental learning,case study,field trips	10
4	Curves: Classification and use; elements of circular curves, calculations, setting outCurves by offsets and by theodolites, compound curves, reverse curves, transition curves,Vertical curves Introduction to DGPS	Lectures with problem based learning, experimental learning,case study,field trips	10
5	Control Surveys: Providing frame work of control points, triangulation principle,Reconnaissance, selection and marking of stations, angle measurements and corrections, baseline Measurement and corrections, computation of sides, precise traversing, Introduction & principlesof hydrographic survey.	Lectures with problem based learning, experimental learning,case study,field trips	

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	chain surveying	Experiments	BL3-Apply	3
2	compass surveying	Experiments	BL3-Apply	3
3	dumpy level	Experiments	BL2-Understand	3
4	plane table survey	Experiments	BL2-Understand	3
5	auto level survey	Experiments	BL3-Apply	3

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0

Part E

Books	N.N. Basak
Articles	https://books.google.co.in/books/about/Surveying_Vol_I.html?id=EM-sLyVmMwIC&redir_esc=y
References Books	Dr. B.C. Punmia
MOOC Courses	https://www.mooc-list.com/tags/surveys
Videos	https://www.youtube.com/watch?v=chhuq_t40rY

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	1	3	2	2	2	1	1	-	-	3	2	1
CO2	1	2	1	1	1	2	1	2	1	2	3	-	3	3	1
CO3	1	1	1	2	1	-	-	-	-	-	-	-	-	-	-
CO4	1	2	3	1	3	3	3	2	1	2	-	2	3	3	1
CO5	1	1	1	-	2	-	-	-	-	-	-	-	-	-	-
CO6	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Fundamentals of Geotechnical Engineering
Course Code	CEL0408[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	1	1	5
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	basic knowledge of soil and its properties			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** CO1: To remember the various concepts in theory of geotechnical engineering.**(BL1-Remember)** **CO2-** • CO2: To understand & analyze the different geotechnical engineering problems.**(BL2-Understand)** **CO3-** • CO3: To implement the shear strength parameters, consistency limits used in geotechnical engineering.**(BL3-Apply)** **CO4-** • CO4: To provide experimental basis, and to enable the students to suggest the type of shear tests to be conducted depending on soil conditions and the type of earth pressure depending on the wall conditions.**(BL2-Understand)** **CO5-** • CO5: To evaluate the stress distribution in soils and stability of slopes. **(BL5-Evaluate)** **CO6-** • CO6: To apply the understanding of index properties of soil, stress distribution and flow net in soil in solving problems of type of stresses in soil and compressibility and consolidation theories in soil. **(BL2-Understand)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Basic Definitions & Index Properties: Definition and scope of soil mechanics, Historical development. Formation of soils. Soil composition. Minerals, Influence of clay minerals on engineering behaviour. Soil structure. Three phase system. Index properties and their determination. Consistency limits. Classification systems based on particle size and consistency limits.	Lectures with problem based learning, experimental learning,case study,field trips	10
2	Soil Water and Consolidation: Soil water, Permeability Determination of permeability in laboratory and in field. Seepage and seepage pressure. Flow nets, uses of a flownet,calculation of stresses. Compressibility and consolidation, Relationship between pressure and void ratio, Theory of one dimensional consolidation. Consolidation test, Fitting Time curves. Normally and over consolidated clays. Determination of preconsolidation pressure, settlement analysis. Calculation of total settlement.	Lectures with problem based learning, experimental learning,case study,field trips	10
3	Stress Distribution in Soils and Shear Strength of Soils: Stress distribution beneath loaded areas by Boussinesq and water gaurd's analysis. Newmark's influence chart. Contact pressure distribution. Mohr - Coulomb's theory of shear failure of soils, Mohr's stress circle, Measurement of shear strength, Shear box test, Triaxial compression test, unconfined compression test, Value shear test, Measurement of pore pressure, pore pressure parameters, critical void ratio, Liquefaction.	Lectures with problem based learning, experimental learning,case study,field trips	10
4	Slopes and stabilization of soil. Types of slope failures, Rotational slips. Stability number. Effect of ground water. Selection of shear strength parameters in slope stability analysis. Analytical and graphical methods of stability analysis. Stability of Earth dams. STABILIZATION OF SOIL: Introduction, Mechanical stabilization, Cement stabilization, Lime stabilization, Bituminous stabilization, Chemical stabilization, Thermal stabilization, Electrical stabilization, Stabilization by grouting, Use of geo-synthetic materials, Types, Functions and applications of geo-synthetics, Reinforced earth structures-components and construction.	Lectures with problem based learning, experimental learning,case study,field trips	10
5	Lateral Earth Pressure: Active, passive and earth pressure at rest. Rankine, Coulomb, Terzaghi and Culmann's theories. Analytical and graphical methods of determination of earth pressures on cosion-less and cohesive soils. Effect of surcharge, water table and wallfriction. Arching in soils. Reinforced earth retaining walls.	Lectures with problem based learning, experimental learning,case study,field trips	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	casagrande apparatus	Experiments	BL2-Understand	3
2	permeability test	Experiments	BL3-Apply	3
3	sieve analysis	Experiments	BL2-Understand	3
4	water content	Experiments	BL2-Understand	3

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	

Part E

Books	Gopal Ranjan and Rao
Articles	https://books.google.com.na/books?id=U2AvQrA6I4sC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
References Books	Dr. B.C.Punmia
MOOC Courses	https://onlinecourses.nptel.ac.in/noc22_ce74/preview
Videos	https://www.youtube.com/watch?v=V1m3cB-Aqy8

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	2	2	2	-	3	3	1	2	2	3	3	2
CO2	1	2	2	2	2	2	-	2	2	3	1	3	2	3	3
CO3	1	1	1	2	1	-	-	-	-	-	-	-	-	-	-
CO4	1	2	2	3	2	3	-	3	3	3	3	2	3	3	2
CO5	1	1	1	2	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Elementary Design of Structures (Steel)
Course Code	CEL0432[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	1	2	6
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basics of Autocad, Limit State Design and Working Stress Method			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember basic types of loading and steel structures**(BL1-Remember)** **CO2-** To understand different types of connections in steel members**(BL2-Understand)** **CO3-** To implement the knowledge of IS Code for Structural Design of Steel members**(BL3-Apply)** **CO4-** To Design different members like flexural and compression**(BL2-Understand)** **CO5-** To evaluate the different loading conditions according to different connections**(BL2-Understand)** **CO6-** To Create a Structural member fir for Different Loading Conditions**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Various loads and mechanism of the load transfer, partial load factors, structural properties of steel, design of structural connections- bolted, riveted and welded connections.	Lectures with problem based learning, experimental learning,case study,field trips	8
2	Design of Bolted and Riveted Connections	Lectures with problem based learning, experimental learning,case study,field trips	10
3	Design of Welded Connections.	Lectures with problem based learning, experimental learning,case study,field trips	8
4	Design of Tension members and bracing systems.	Lectures with problem based learning, experimental learning,case study,field trips	10
5	Design of Compression members.	Lectures with problem based learning, experimental learning,case study,field trips	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Analysis of different compressive strength of column for different sizes	PBL	BL4-Analyze	3
2	Tensile structure using steel chain connections	PBL	BL6-Create	3

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	

Part E

Books	S.K. Duggal, Steel Structure, T.M.H Publication
Articles	https://pdfcoffee.com/design-of-steel-structure-3rd-edition-by-s-k-duggal-4-pdf-free.html
References Books	S.S. Bhavikatti, Design of Steel Structure, Vikas Publication
MOOC Courses	https://www.my-mooc.com/en/mooc/introduction-steel-tenarisuniversity-steel101x-1/
Videos	https://www.youtube.com/watch?v=_sG6L8Abfss

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	2	2	-	-	3	3	-	-	3	-	2
CO2	3	3	1	2	-	2	-	-	2	3	-	-	2	2	1
CO3	2	2	2	-	-	-	-	-	2	1	-	-	1	-	1
CO4	1	1	2	3	1	-	-	-	-	-	-	-	2	-	2
CO5	1	1	1	2	1	-	-	-	-	-	-	-	2	-	2
CO6	-	-	-	-	-	-	-	-	2	2	-	-	1	2	1

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Advanced Surveying
Course Code	CEL0511[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	1	2	6
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s	Students should have the basic knowledge of fundamentals of surveying			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** CO1: Students will revise the concept of Surveying with its Principles.**(BL1-Remember)** **CO2-** CO2: Students are able to understand the surveying with advance instrument like remote sensing, GPS and GIS, hydrographic survey and Arial Photogrammetry.**(BL2-Understand)** **CO3-** CO3: Students are able to Take the Data concerning different types of Surveying Instruments.**(BL3-Apply)** **CO4-** CO4:To analyze Indeterminate structures and towers according to dynamic loading**(BL4-Analyze)** **CO5-** CO5: Students will be able to Process the GIS and GPS and Hydrographic Data and evaluate the Different Dimensions of Image projections**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**						

Part B

Modules	Contents	Pedagogy	Hours
1	Modern equipments for surveying: Digital levels and theodolites, Electronic Distance measurement (EDM), Total Station and Global Positioning Systems (GPS), Digital Planimeter.	Lectures with problem based learning, experimental learning, case study, field trips	10
2	Hydrographic Surveying: various type of survey for hydrographic, sounding, method of observation, equipment for sounding, computations and plotting, discharge measurement, area measurement, rain gauging, marine surveying.	Lectures with problem based learning, experimental learning, case study, field trips	8
3	GPS Surveying: Introduction & components of GPS, Space segment, control segment and user segment, Elements of Satellite based surveys-Map datum, GPS receivers, GPS observation methods and their advantages over conventional methods.	Lectures with problem based learning, experimental learning, case study, field trips	10
4	Photogrammetry: Principle, definitions and classifications of terrestrial and aerial photogrammetry, flight planning for aerial photography, scale and relief displacements of vertical aerial photographs, stereoscopic vision on vertical photographs, computation of position, length and elevations of objects using photographs and photo mosaic.	Lectures with problem based learning, experimental learning, case study, field trips	8
5	Remote Sensing: Principle, components, classification, remote sensing data acquisition process, different types of remote sensing satellite imagery with special relevance to Indian Remote Sensing Satellites (IRS) and applications. Geographic Information Systems (GIS): Definition, components and advantages.	Lectures with problem based learning, experimental learning, case study, field trips	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study the intersection method of Plane Table Survey	Field work	BL2-Understand	4
2	To study the contouring for different levels	Field work	BL3-Apply	4
3	To study the Resection method by Plane Tabling	Field work	BL4-Analyze	4
4	To determine levels by Reciprocal Levelling	Field work	BL5-Evaluate	4
5	To determine the location by Global Positioning System	Field work	BL6-Create	4

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	30
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	Advance Surveying volume II & III - B.C.Punmia
Articles	https://khannapublishers.in/index.php?route=product/product&path=60&product_id=142, Advanced-Surveying-Station-Remote-Sensing/dp/8131700674
References Books	Advanced Surveying Vol. II - S.K. Duggal
MOOC Courses	http://acl.digimat.in/nptel/courses/video/105107121/L22.html
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	3	3	-	1	3	-	2
CO2	1	-	1	2	1	3	-	-	3	3	-	2	3	2	2
CO3	-	1	-	1	2	-	2	-	1	-	-	-	3	2	2
CO4	1	-	1	2	2	-	2	-	1	-	-	-	3	-	2
CO5	-	-	1	2	2	-	-	-	-	-	-	-	3	-	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Quantity Surveying & Costing
Course Code	CEL0621[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	1	2	6
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	introduction of material			**Co-Requisite/s**	basic knowledge of materials			
Course Outcomes & Bloom's Level	**CO1-** To remember the various concepts in theory of Specification**(BL1-Remember)** **CO2-** To understand & analyze the different Quantity Estimates**(BL4-Analyze)** **CO3-** : To implement the different designing concepts of Quantity Estimation.**(BL5-Evaluate)** **CO4-** To provide experimental basis, and to enable the students to analyze the quantity and cost estimates.**(BL3-Apply)** **CO5-** To evaluate the applications of different Estimation and Costing in various fields such as research & industries.**(BL3-Apply)** **CO6-** : To apply the understanding of Rate Analysis in solving problem of Estimation**(BL2-Understand)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
unit 1	Purpose and importance of estimates, principles of estimating methods of taking out Quantities of items of work. Mode of Measurement, Measurement sheet and adstract sheet; bills of quantities	Lectures with problem based learning, experimental learning, case study, field trips	10
unitII	Types of estimate, plinth area rate, cubical content rate, preliminary original, revised and supplementary estimates different projects preparing detailed estimates of various types of Building, RCC work earth work calculations for roads and estimating of culverts. Services for building such as water supply, drainage.	Lectures with problem based learning, experimental learning, case study, field trips	9
unit III	Rate Analysis: Task for average artisan, various factors involved in the rate of an item, material and labour requirement for various trades; preparation for rates of important items of work. Current schedule of rates (C.S.R), Specification.	Lectures with problem based learning, experimental learning, case study, field trips	8
unit IV	Cost works : Factors affecting cost of work, overhead charges Contingencies and work charge establishment, various percentage for different services in building.	Lectures with problem based learning, experimental learning, case study, field trips	10
unit V	Valuation : Purpose, depreciation, sinking fund. scrap value year's purchase, gross and net income, dual rates interest. Method of Valuation, rent fixation of buildings.	Lectures with problem based learning, experimental learning, case study, field trips	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	module of bulding	PBL	BL4-Analyze	3

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0

Part E

Books	BN Dutta
Articles	https://www.scribd.com/document/545528438/Estimating-and-Costing-in-Civil-Engineerng-B-N-Dutta-24th-Ed
References Books	Estimation and Costing in Civil Engineering by S. Dutta
MOOC Courses	https://www.my-mooc.com/en/mooc/construction-cost-estimating/
Videos	https://www.youtube.com/watch?v=aO3Ol3XLHkI

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	3	-	2	-	2	3	3	1	-	-	-	1
CO2	-	2	3	2	3	-	-	1	-	1	-	2	-	-	1
CO3	2	-	1	3	1	-	-	1	2	-	-	1	2	-	3
CO4	1	2	-	-	1	1	-	-	2	-	-	3	-	1	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Environmental Engineering
Course Code	CEL0634[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					3	1	2	6
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the various concepts in theory of sources of water.**(BL1-Remember)** **CO2-** To understand & analyze the concept of population forecasting**(BL2-Understand)** **CO3-** To provide experimental basis, and to enable the students to analyze physical, chemical and biological impurities**(BL4-Analyze)** **CO4-** To evaluate the applications of rain water harvesting**(BL5-Evaluate)** **CO5-** To apply the understanding of water treatment**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Sewerage schemes and their importance, collection & conveyance of sewage, storm water quantity, fluctuation in sewage flow, flow through sewer, design of sewer, construction & maintenance of sewer, sewer appurtenances, pumps & pumping stations.	Lectures with Presentation, Site Visit to STP	8
2	Characteristics and analysis of waste wate, rcycles of decomposition, physical, chemical & biological parameters. Oxygen demand i.e. BOD & COD, TOC, TOD, Th OD, Relative Stability, population equivalent, instrumentation involved in analysis, natural methods of waste water disposal i.e. by land treatment & by dilution, self purification capacity of stream, Oxygen sag analysis.	Lectures with Presentation, Seminar and experiments	8
3	Unit operations for waste water treatment, preliminary treatment such as screens, grit chamber, floatation tank, sedimentation and chemical clarification, role of micro-organism in biological treatment, Sewage filtration- theory & design.	Lectures with Presentation, Site Visit to STP	8
4	Methods of Biological Treatment (Theory & Design) - Activated Sludge process, Oxidation ditch, stabilization ponds, aerated lagoon, anaerobic lagoons, septic tank & imhoff tank, sources & treatment of sludge, sludge thickening and digestion sludge drying beds, sludge disposal.	Lectures with Presentation, Seminar and experiments	8
5	Advanced Waste Water treatment - Diatomaceorus earth filters, ultrafiltration, Adsorption by activated carbon, Phosphorus removal, Nitrogen removal, Physico chemical waste water treatment, Solid waste disposal - classification, composition, collection, & disposal methods. Rural sanitation - collection & disposal of refuse, sullage & night soil.	Lectures with Presentation, Seminar and experiments	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Physical examination of Sewage/Water: a. Total Solid b. Total dissolve solid c. Total suspended solid d. pH, color and odor	Experiments	BL4-Analyze	8
2	Chemical estimation of Sewage/Water and soil a. Determination of Chlorides b. Estimation of Chemical oxygen Demand	Experiments	BL4-Analyze	4
3	Microbial examination of Sewage/Water a. Confirmation of coliforms b. Biological oxygen demand	Experiments	BL4-Analyze	4
4	Determination of soil microbial biomass carbon	Experiments	BL4-Analyze	2
5	Examination of different bacteria, algae, fungi, plants and animals by microscopic or morphological examination	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	0

Part E

Books	S.K.Garg, Environmental engineering volume 1 and 2 Khanna publisher B.C.Punamia Environmental engineering volume 1 and 2 Laxmi Publication
Articles	https://sciendo.com/journal/CEE
References Books	Viesman, Hammer and Chadik Water supply and pollution control PHI Publication
MOOC Courses	https://nptel.ac.in/courses/103107084
Videos	http://www.digimat.in/nptel/courses/video/105107176/L01.html

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	-	-	2	-	-	-	1	2	2	2	1
CO2	2	2	2	2	-	-	2	-	-	-	1	3	2	2	2
CO3	2	2	1	2	-	-	3	-	-	-	2	2	2	3	3
CO4	2	3	1	2	-	-	2	-	-	-	1	2	2	3	2
CO5	2	2	1	2	-	-	3	-	-	-	1	3	2	3	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Railway Engineering
Course Code	CEL0731[T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	have the knowledge of basic transportation			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Students will be able to distinguish different components of Railway Track, different Railway Gauges**(BL1-Remember)** **CO2-** Students will be able to Design track Gradients as per given requirements**(BL4-Analyze)** **CO3-** Students will be able to discuss various Types of Track Turnouts**(BL2-Understand)** **CO4-** Students will be able to describe purposes and facilities at Railway Stations**(BL3-Apply)** **CO5-** Students will be able to Explain Interlocking and modern signal system**(BL3-Apply)** **CO6-** Students will be able to Describe Surface Defects on Railway Track and Their Remedial Measures**(BL2-Understand)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Sources of water & their estimation, water quality from ground & surface waters, various types of water demand requirement of water for various uses, Population forecasting methods.	lecture with experimental learning, interactive workshops, field trips	8
2	General impurities of water, characteristics of water, impurities present & their significance, water borne diseases control, Analysis of water physical, chemical, bacteriological water standard for different uses intake structure, water conveyance, conduit for transportation, pumps for water riffing- materials, operation & pumping station	lecture with experimental learning, interactive workshops, field trips	8
3	Purification of water supply, treatment methods, design, screening segmentation, coagulation, filtration, disinfection, aeration softening of water, advancement & technologies used in sedimentation, filtration . Miscellaneous treatment methods.	lecture with experimental learning, interactive workshops, field trips	8
4	Distribution systems- layout hydraulics, pipe fittings, values. Appurtenances in distribution system, analysis of distri system & pips network – Hardy cross method, detection of leakage, maintenance, location & height of distribution reservoir , service reservoir capacity	lecture with experimental learning, interactive workshops, field trips	8
5	Rural water supply scheme-System in water supply, financing and management of water supply project, water pollution control act, conservancy & water carriage system, sanitary appliance and their operation.	lecture with experimental learning, interactive workshops, field trips	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	The Student Shall Draw The Dimensional Sketches(Along with Brief Note)of Different gauges(as per IRC)	PBL	BL3-Apply	3
2	The Student Shall Draw The Dimensional Sketches(Along with Brief Note)of different rail sections, sleepers, track fittings, points and crossings	PBL	BL2-Understand	3
3	Students may be asked to collect photographs from internet which is related to field application of various topics	Field work	BL3-Apply	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
0	0	0	0	0	0

Part E

Books	Railway Engineering by Satish Chandra and M.M. Agrawal Oxford University Press, New Delhi
Articles	https://www.springerprofessional.de/en/journal-of-modern-transportation/16439126
References Books	A Text Book of Railway Engineering by S.C. Saxena and S. P. Arora. Dhanpat Rai & Sons, Delhi
MOOC Courses	https://nptel.ac.in/courses/105107123
Videos	https://www.youtube.com/watch?v=37WMS483T7Y&t=2s https://ia902309.us.archive.org/6/items/eco-8/ECO8.pdf

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	2	2	2	2	3	3	1	2	2	3	3	1
CO2	1	2	2	2	2	2	1	2	2	3	1	3	2	3	3
CO3	1	1	-	-	-	-	-	-	-	2	3	2	2	1	2
CO4	1	2	2	3	2	3	1	3	3	3	2	2	3	2	1
CO5	1	2	2	3	2	2	1	2	2	1	1	2	2	2	2
CO6	2	3	2	1	1	-	-	-	-	1	2	2	2	2	1

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Retrofitting and rehabilitation of structures
Course Code	CEL0831[T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Students will be able to learn various distress and damages to concrete and masonry structures**(BL1-Remember)** **CO2-** To understand the importance of maintenance of structures**(BL2-Understand)** **CO3-** To study the various types and properties of repair materials**(BL2-Understand)** **CO4-** To asses the damage to structures using various tests **(BL4-Analyze)** **CO5-** To learn the importance and methods of substrate preparation**(BL3-Apply)** **CO6-** To learn various repair techniques of damaged structures, corroded structures **(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction Maintenance, rehabilitation, repair, retrofit and strengthening, need for rehabilitation of structures. Cracks in R.C. buildings Various cracks in R.C. buildings, causes and effects Maintenance Maintenance importance of maintenance, routine and preventive maintenance. Damages to masonry structures Various damages to masonry structures and causes	Lectures with problem based learning, experimental learning, case study, field trips	10
2	Repair materials Various repair materials, Criteria for material selection, Methodology of selection, Health and safety precautions for handling and applications of repair materials Special mortars and concretes Polymer Concrete and Mortar, Quick setting compounds Grouting materials Gas forming grouts, Salfoalumate grouts, Polymer grouts, Acrylate and Urethane grouts. Bonding agents Latex emulsions, Epoxy bonding agents. Protective coatings Protective coatings for Concrete and Steel FRP sheets	Lectures with problem based learning, experimental learning, case study, field trips	10
3	Damage diagnosis and assessment Visual inspection, Non Destructive Testing using Rebound hammer, Ultra sonic pulse velocity, Semi destructive testing, Probe test, Pull out test, Chloride penetration test, Carbonation, Carbonation depth testing, Corrosion activity measurement Substrate preparation Importance of substrate/surface preparation, General surface preparation methods and procedure, Reinforcing steel cleaning	Lectures with problem based learning, experimental learning, case study, field trips	10
4	Crack repair Various methods of crack repair, Grouting, Routing and sealing, Stitching, Dry packing, Autogenous healing, Overlays, Repair to active cracks, Repair to dormant cracks. Corrosion of embedded steel in concrete Corrosion of embedded steel in concrete, Mechanism, Stages of corrosion damage, Repair of various corrosion damaged of structural elements (slab, beam and columns)	Lectures with problem based learning, experimental learning, case study, field trips	8
5	Jacketing Jacketing, Column jacketing, Beam jacketing, Beam Column joint jacketing, Reinforced concrete jacketing, Steel jacketing, FRP jacketing. Strengthening Strengthening, Beam shear strengthening, Flexural strengthening	Lectures with problem based learning, experimental learning, case study, field trips	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To Assess the maintenance of Buildings	PBL	BL4-Analyze	15
2	To diagnose the best technique for failiure of different components of concrete masonary structures	PBL	BL3-Apply	15

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	20	60	

Part E

Books	1. Repair and protection of concrete structures by Noel P.Mailvaganam, CRC Press,1991. 2. Concrete repair and maintenance Illustrated by Peter.H.Emmons, Galgotia publications Pvt. Ltd., 2001. 3. “Earthquake resistant design of structures” by Pankaj agarwal, Manish shrikande, PHI, 2006.
Articles	https://www.researchgate.net/publication/344775584_Modern_Techniques_for_the_Restoration_and_Rehabilitation_of_Concrete_Structures
References Books	1. Failures and repair of concrete structures by S.Champion, John Wiley and Sons, 1961. 2. Diagnosis and treatment of structures in distress by R.N.Raikar Published by R & D Centre of Structural Designers and Consultants Pvt.Ltd, Mumbai. 3. Handbook on repair and rehabilitation of RCC buildings, CPWD, Government of India. 4. Handbook on seismic retrofit of buildings, A. Chakrabarti et.al., Narosa Publishing House, 2010
MOOC Courses	https://archive.nptel.ac.in/courses/105/105/105105213/
Videos	https://www.youtube.com/watch?v=widz1C17omE&embeds_referring_euri=https%3A%2F%2Farchive.nptel.ac.in%2F&source_ve_path=OTY3MTQ&feature=emb_imp_woyt

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	3	3	-	-	3	-	2
CO2	2	-	2	2	1	2	-	-	3	3	-	-	3	2	2
CO3	-	-	2	1	1	-	-	-	2	1	-	-	3	2	2
CO4	-	1	2	3	1	-	-	-	-	-	-	-	3	-	2
CO5	-	1	1	2	1	-	-	-	-	-	-	-	3	-	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Engineering Graphics
Course Code	MEL0202[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of geometrical construction, sketching, imagination etc.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To get the fundamentals of engineering graphics, geometrical construction and its applications.**(BL1-Remember)** **CO2-** To understand the basic concept of engineering graphics through real-life examples. **(BL2-Understand)** **CO3-** To implement the different engineering graphics concepts over appropriate drawing dataset. **(BL3-Apply)** **CO4-** To analyze the drawing performance of engineering graphics techniques.**(BL4-Analyze)** **CO5-** To evaluate the drawing performance of engineering graphics techniques on a corresponding object.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	1. Drafting tools, 2. Principles of Graphics, 3. Geometrical constructions 4. Scales: Plain, diagonal, 5. Curves used in engineering practice: such as ellipse, parabola, hyperbola by different methods. Cycloidal curves, Involutes and Spirals.	Whiteboard, PPT	8
Unit-2	1. Types of projection, Orthographic projections, First angle and third angle projection. 2. Projections of points in different quadrants. Projections of lines, True inclination and true length of straight line, Traces.	Whiteboard, PPT	8
Unit-3	Projections of planes: Perpendicular plane, oblique plane and Auxiliary plane, projection of planes with inclined to one or both the reference planes and traces of planes.	Whiteboard, PPT	8
Unit-4	1. Projection of solids: Polyhedron and solids of revolution, projection of solids with inclined to one or both the reference planes. 2. Introduction to Section of solids and Development of surfaces.	Whiteboard, PPT	8
Unit-5	1. Isometric projection: Isometric scale, isometric projections from orthographic drawing. 2. Computer Aided Drafting (CAD): Introduction, benefit, software's, basic commands of drafting entities like line, circle, polygon, polyhedron, cylinders; transformations and editing commands like move, rotate, mirror, array; solution of projection problems on CAD.	Whiteboard, PPT	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment -1	Drawing sheet of plane scale.	Experiments	BL3-Apply	2
Experiment -2	Drawing sheet of diagonal scale.	PBL	BL3-Apply	2
Experiment -3	Drawing sheet of ellipse.	PBL	BL3-Apply	2
Experiment -4	Drawing sheet parabola and hyperbola		BL3-Apply	2
Experiment -5	Drawing sheet of cycloidal curves.		BL3-Apply	2
Experiment -6	Drawing sheet of orthographic projection		BL3-Apply	2
Experiment -7	Drawing sheet of projection of line		BL3-Apply	2
Experiment -8	Drawing sheet of projection of plane.		BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	1. N.D.Bhatt Elementary of Enginnering Drawing Charotar Publication P.S. Gill Engineering Drawing Kataria Publication Agrawal and Agrawal Engineering Drawing TMH
Articles	
References Books	Venu Gopal K Engineering Drawing New age K.L. Narayana& P. Kannaiah Engineering Drawing SCITECH Pub.
MOOC Courses	https://nptel.ac.in/courses/112103019
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	3	3	-	-	3	-	2
CO2	2	-	2	2	1	2	-	-	3	3	-	-	3	2	2
CO3	-	-	2	1	1	-	-	-	2	1	-	-	3	2	2
CO4	-	1	2	3	1	-	-	-	-	-	-	-	3	-	2
CO5	-	1	1	2	1	-	-	-	-	-	-	-	3	-	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-CivilEngineering

Title of the Course	Mechanical Workshop Practice
Course Code	MEP0101[P]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of casting, joining and machining.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember basics of physics.**(BL1-Remember)** **CO2-** To understand the tool materials and their proper applications.**(BL2-Understand)** **CO3-** To prepare and manufacture the various joints using carpentry and fitting shop tools and welding process.**(BL3-Apply)** **CO4-** To analyze casting and welding products.**(BL4-Analyze)** **CO5-** To evaluate the casting process parameters and welding parameters for efficient productivity.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Carpentry Shop Carpentry, process of finished products, building work, furniture, cabinet making Etc. joinery, preparation of joints, Timber, Timber sizes, classification of Timber, Characteristics of good timber, seasoning of wood.	Lectures with whiteboard/PPT, Recorded video/interactive videos, Quiz	
Unit-2	Marking and Measuring Tools Steel rule and Steel tape, Marking gauge, Try-square, Compass and divider, Scriber or marking knife, Bevel, Holding Tools- Carpenter's vice, C-clamp , Bar cramp, Planning Tools- Jack plane, Smoothing plane, Rebate plane, Plough plane Cutting Tools- Saws, Cross-cut or hand saw, Rip saw, Tenon saw, Compass saw, Chisels, Drilling and boring tools- Carpenter's brace, Auger bit, Hand drill, Gimlet, miscellaneous tools- Mallet, Pincer, Claw hammer, Screw driver, Wood rasp file, Bradawl, wood joints- Lap joints, Mortise and Tenon Joints, Bridle joint.	Lectures with whiteboard/PPT, Recorded video/interactive videos, Quiz	
Unit-3	Welding Shop Electric arc welding, Gas welding, Thermal welding, Electrical Resistance welding, Friction welding Equipment Used for Welding- Transformers, Motor generators, Rectifiers, Welding cables, Electrodes, electrode holder, Ground clamp, wire brush and chipping hammer, Welding table and cabin, Face shield, Hand gloves. Techniques of welding Preparation of work, striking an arc, Strike and Withdraw, Touch and with draw, Weaving, Types of Joints- Butt Joint, Corner Joint, Tee Joint, Lap joint, Edge welding positions- Flat position welding, Horizontal position welding, Vertical position welding, Overhead position welding.	Lectures with whiteboard/PPT, Recorded video/interactive videos, Quiz	
Unit-4	Fitting Shop Introduction hand fitting,the assembly of machine tools, jigs, gauges, etc., bench work. assembly of mating parts, removal of metal, fit, simple hand tools. filing, chipping, scraping, sawing drilling, and tapping. Holding tools, Cutting Tools -Finishing Tools, Reamers, Files, miscellaneous tools ---- File card, Spirit level, Ball Peen Hammer, Cross Peen, Hammer, Straight-Peen Hammer, Screw driver, Spanners.	Lectures with whiteboard/PPT, Recorded video/interactive videos, Quiz	
Unit-5	Foundry shop Process, Melting, Furnace, Degassing, Mold making, Pouring, Shakeout, Degating, Heat treating, Surface cleaning, Finishing,	Lectures with whiteboard/PPT, Recorded video/interactive videos, Quiz	

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	To study of Tools and Their Operations in Carpentry joint	Experiments	BL2-Understand	4
Experiment-2	To Prepare Half Lap corner joint and T- joint	Experiments	BL3-Apply	4
Experiment-3	To study of tools and their operations in Fitting Shop	Experiments	BL3-Apply	4
Experiment-4	To study of tool and operations in welding shop	Experiments	BL3-Apply	4
Experiment-5	To study of single point cutting tools , machine tool and operations in machine shop	Experiments	BL3-Apply	4

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0	0			
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	1. S. K. Hazra Chowdhry Elements of Workshop Technology Vol-1 Tata Mc Graw Hill Publication 2 John K.C Mechanical Workshop Practice Paperback – 1 Khanna Publishers, 2001
Articles	
References Books	1. English, Paperback, Dave A K, Dubey D Workshop Technology & Practice Standard Publishers, 2010 2. W.A.J. Chapman Workshop Technology by vol. 1,2 Mc Graw Hill, 2001
MOOC Courses	https://archive.nptel.ac.in/courses/112/103/112103108/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	-	-	2	2	1	-	-	2	2	2	1	-	-
CO2	1	2	2	2	2	1	2	2	-	-	-	2	2	3	3
CO3	2	1	2	-	-	-	2	2	-	-	-	2	3	-	3
CO4	1	2	2	-	-	2	1	-	-	2	2	3	3	2	2
CO5	-	2	1	2	2	2	3	2	-	-	-	2	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-Electronics_and_Communication

Title of the Course	Essentials of Information Technology
Course Code	CSL0201[T]

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	2	4
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s	To understand the contents and successfully complete this course, a participant must have a basic understanding of Basics of Computer system, Storage Systems, Operating systems, Networking and Database.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the basics of Computer systems like types, I/O devices, storage of computer systems (Knowledge, Understand)**(BL1-Remember)** **CO2-** Apply the various networking concepts, topologies and remove deadlocks. (Apply).**(BL2-Understand)** **CO3-** Explain various memory management techniques and Analyze the concept of Sub-programs and blocks (Analysis)**(BL3-Apply)** **CO4-** Design the concept of software, operating system for better utilization of external system (Design)**(BL4-Analyze)** **CO5-** Evaluating the various algorithm, its solution and other communication techniques. (Investigation).**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✓ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	Computer Basics: Basics of Computer Systems(T1,T2), Evolution of Computers, Computer Generations, Classification of Computers(T1,T3), Computer Applications, Interaction between User and Computer(T7). Hardware Components, Basic Computer Organization, Input and Output Devices(T1,T3), Central Processing Unit(T1), System Bus Architecture, Memory or Storage Unit	White Board, PPT	6
2	Operating System: Introduction to Operating System, Function of Operating Systems(T1), Working Knowledge of GUI-Based Operating System (T3,T4), Working with latest version of Windows(T3,T4). Various Operating Systems, Evaluation of Operating System(T3,T4,T,7), Virtual Machine, Operating Systems for Mobile, Installation of Operating System(T1,T3,T4), Boot Process.	White Board, PPT	6
3	Computer Networks and World Wide Web: Introduction to Computer Networks (LAN, MAN, WAN, PAN)(T3,T4), Network Topologies, Ethical Issues related to Network Security(T2,T3). Internet and World Wide Web(T7,T8), Internet Evolution(T1), FTP, Electronic Mail, Search Engines(T1), Introduction to HTML, Static and Dynamic Web Pages	White Board, PPT	6
4	Computer Software: Introduction, System Software(T1,T3), Application Software, Firmware(T3), Software Installing and Uninstalling(T3,T4), Software Development Steps, Characteristics of good software(T1,T7), Usability of software, Introduction to Free and Open Source Software(T3,T4), Introduction to Database Management System	White Board, PPT	6
5	Subprograms and Blocks: Problem Solving: Flow Charts(T3,T4), Tracing Flow Chart, Algorithms. Fundamentals of sub-programs(T1,T3,T4), Scope of life time of variables, static and dynamic scope(T7), design issues of subprograms and operations, parameter passing methods(T3,T4), overloaded sub-programs, generic sub-programs(T1,T3), design issues for functions user defined overloaded operators	White Board, PPT	6

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Explain the Installation process of Operating system and its Memory Management.	Experiments	BL2-Understand	10
2-3	Design of a Web Page which describe your Biodata.	PBL	BL3-Apply	10
4-5	Describe Software development life cycle (SDLC) with all components.	PBL	BL5-Evaluate	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	0

Part E

Books	P. K. Sinha, Priti Sinha; Computer Fundamentals; BPB Publication. V. Rajaraman; Fundamentals of Computers; Prentice Hall of India Publication. G. G. Wilkinson; Fundamentals of Information Technology; Wiley-Blackwell Publishing. Yashwant P. Kanetkar; Let Us C; BPB Publication.
Articles	
References Books	E. Balagurusamy; Programming in ANSI C; Tata McGraw-Hill Publishing. Ron Mansfield; Working in MS-Office; Tata McGraw Hill Publishing.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	1	1	2
CO2	1	2	-	-	-	-	-	-	-	-	-	-	3	3	2
CO3	-	-	1	-	-	-	-	-	-	-	-	-	3	2	2
CO4	-	-	-	2	-	-	-	-	-	-	-	-	2	2	2
CO5	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-Electronics_and_Communication

Title of the Course	Major Project-I
Course Code	ECD0704[P]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					0	0	8	8
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To increase writing skills and knowledge**(BL1-Remember)** **CO2-** To enhance their mental ability**(BL2-Understand)** **CO3-** To inculcate the ability to express innovative opinion and thought**(BL3-Apply)** **CO4-** To have Dissertation works as skills development in student **(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-1	Identification of a problem and formulation of a topic of project/Thesis	PBL	BL2-Understand	15
Module-2	T0 have field work and data collection through a chosen methodology	PBL	BL3-Apply	15
Module-3	Dissertation and VIVA-VOCI	PBL	BL4-Analyze	15

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	
Articles	https://www.ietlucknow.ac.in/sites/default/files/mag/Projects%20of%20Electronics%20and%20communication%20deptt._1.pdf
References Books	
MOOC Courses	https://www.coursera.org/learn/major-engineering-project-performance
Videos	https://nptel.ac.in/courses/110104073

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	1	-	-	1	2	3	-	-	-	3	1	-
CO2	-	3	2	3	-	3	1	-	3	3	-	2	-	2	2
CO3	-	-	3	3	3	-	-	3	3	3	1	2	-	3	2
CO4	-	-	-	-	-	-	3	3	3	3	2	3	-	3	3
CO5	-	-	-	-	-	-	-	-	3	3	-	3	-	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-Electronics_and_Communication

Title of the Course	Major Project-II
Course Code	ECD0805[P]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					0	0	8	8
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To increase writing skills and knowledge **(BL2-Understand)** **CO2-** To enhance their mental ability**(BL3-Apply)** **CO3-** To inculcate the ability to express innovative opinion and thought**(BL4-Analyze)** **CO4-** To have Dissertation works as skills development in student **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-1	Identification of a problem and formulation of a topic of project/Thesis	PBL	BL6-Create	15
Module-2	T0 have field work and data collection through a chosen methodology	PBL	BL6-Create	15
Module-3	Dissertation and VIVA-VOCI	PBL	BL6-Create	15

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1)Electronics for you https://www.electronicsforu.com/category/electronics-projects/hardware-diy
Articles	https://www.ietlucknow.ac.in/sites/default/files/mag/Projects%20of%20Electronics%20and%20communication%20deptt._1.pdf
References Books	1)Electronics for you https://www.electronicsforu.com/category/electronics-projects/hardware-diy
MOOC Courses	https://www.coursera.org/learn/major-engineering-project-performance
Videos	https://nptel.ac.in/courses/110104073

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	1	-	-	1	2	3	-	-	-	3	1	-
CO2	-	3	2	3	-	3	1	-	3	3	-	2	-	2	2
CO3	-	-	3	3	3	-	-	3	3	3	1	2	-	3	2
CO4	-	-	-	-	-	-	3	3	3	3	2	3	-	3	3
CO5	-	-	-	-	-	-	-	-	3	3	-	3	-	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-Electronics_and_Communication

Title of the Course	IoT Data Analytics
Course Code	ECE0763 [T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Open Elective							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Be able to understand the concepts and applications of IoT, and understand the core problems (e.g., networking, sensing) for building IoT systems **(BL1-Remember)** **CO2-** Be able to understand and manage the knowledge of models and principles and compare the performance of key techniques for IoT data analytics**(BL2-Understand)** **CO3-** Apply statistical methods to develop and evaluate the models. **(BL3-Apply)** **CO4-** Analysis the data collected from different applications. **(BL4-Analyze)** **CO5-** Evaluate statistical methods in EDA. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger)				

Part B

Modules	Contents	Pedagogy	Hours
I	INTRODUCTION : Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues	Lecture Method/Video Clips/Group Discussion	10
II	DATA COLLECTION AND PRE-PROCESSING: Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.	Lecture Method/Video	10
III	EXPLORATORY DATA ANALYTICS: Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA.	Lecture Method/Video	10
IV	MODEL DEVELOPMENT: Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sample Evaluation – Prediction and Decision Making.	Lecture Method/Video Clips/Group Discussion	10
V	MODEL EVALUATION: Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Overfitting – Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search.	Lecture Method/Video	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
2-4	Real time collected Data preprocessing	PBL	BL4-Analyze	20

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Jojo Moolayil Smarter Decisions: The Intersection of IoT and Data Science SAE Publication Iqbal Hussein Electric and Hybrid Vehicles: Design Fundamentals CRC Press, 2003
Articles	Al-Ali, A. R., et al. "Role of IoT technologies in big data management systems: A review and Smart Grid case study." Pervasive and Mobile Computing (2024): 101905.
References Books	Cathy O'Neil and Rachel Schutt Doing Data Science O'Reilly , 2015 David Dietrich, Barry Heller, Beibei Yang Toney Weir Data Science and Big data Analytics EMC 2013
MOOC Courses	https://www.udemy.com/course/iot-data-analytics/?couponCode=24T3MT53024
Videos	https://www.youtube.com/watch?v=JIi_jUvVAHw

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	-	1	-	-	-	-	-	-	-	1	-	1
CO2	2	-	1	1	-	-	-	-	-	-	-	-	-	1	-
CO3	-	2	-	2	-	-	-	-	-	-	-	-	1	-	1
CO4	1	2	-	-	1	-	-	-	-	-	-	-	-	2	-
CO5	1	-	1	-	2	-	-	-	-	-	-	-	-	-	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-Electronics_and_Communication

Title of the Course	Wireless Networks
Course Code	ECE0843[T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Specific Elective							
Pre-Requisite/s	Basic Knowledge of Cellular communication and communication protocols			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the concepts of cellular and mobile communication**(BL1-Remember)** **CO2-** To understand & gain the knowledge on 1G, 2G, 3G, 4G and 5G technology. **(BL2-Understand)** **CO3-** To apply to select the suitable network depending on the availability and requirement**(BL3-Apply)** **CO4-** To analyzing the suitable network depending on the availability and requirement. **(BL4-Analyze)** **CO5-** To evaluation of various mobile communication parameter (Gain, Bandwidth etc).**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction and Development of Wireless Network: Growth of mobile communication, First generation system, Second Generation system, Path to third generation technology, 4G and Beyond, Next generation wireless network, Mobile communication fundamental, basic network architecture, Air interface access techniques , Roaming and Handoff/ Handover, Mobile data in wireless network.	Lecture Method / Video/ Group Discussion / Simulation	12
2	Equalizers- Fundamentals of Equalization, Equalizers in Communication Receiver, Linear Equalizer, Algorithms for Adaptive Equalization, Diversity Techniques. Characteristics of Speech Signals, Quantization Techniques, Vocoders, Linear Predictive Coders, Multiple Access Techniques for Wireless Communications. Third generation Technology: Introduction, Universal Mobile Telecommunication System (UMTS), Wideband code division multiple access(WCDMA) basics, WCDMA air interface, UMTS Terrestrial radio access network (UTRAN) architecture, High speed packet data, High speed packet access (HSPA) architecture , Code division multiple access 2000 (CDMA2000), Time division –code division multiple access (TD-CDMA), Time division – synchronous code division multiple access (TD-SCDMA)T5, Implementation , Handover and comparisons.	Lecture Method / Video/ Group Discussion / Simulation	10
3	Long Term Evolution: Introduction, LTE ecosystem, Standards, radio spectrum, LTE Architecture, User equipment (UE), Enhanced Node B (eNodeB), Core network, radio channel components, TD-LTE, LTE scheduler, Handover (X2, S1 and inter- MME), Self organizing network (SONs), Relay cell, heterogeneous network (Het NET), Vo LET, LTE advanced.	Lecture Method / Video/ Group Discussion	10
4	Worldwide Interoperability for Microwave (WIMAX): Introduction, Standards, generic WiMAX architecture, Core network, radio network, WiMAX spectrum, WiMAX modulation, Channel structure, Mixed mode, frequency planning and Quality of service (QOS), handover, WiMAX Features and applications.	Lecture Method / Video/ Group Discussion	10
5	Wi-Fi: Introduction, Standards, Protocols, Frequency Allocation, Modulation and Coding Schemes, Network architecture, Typical Wi-Fi configuration, Hotspots, VPNs, Wi-Fi Integration with 3G/ 4G security, Benefits of convergence of Wi-Fi and wireless Mobile	Lecture Method / Video/ Group Discussion	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	(1) Clint Smith and Daniel Collins, Wireless Network, McGraw Hill education (2) Jochen Schiller, Mobile Communications, Second Edition, Pearson Education (3) Vijay Garg, Wireless Communications and networking, First Edition, Elsevier
Articles	(1) Liang, Chengchao, and F. Richard Yu. "Wireless network virtualization: A survey, some research issues and challenges." IEEE Communications Surveys & Tutorials 17.1 (2014): 358-380. (2) Zhang, Chaoyun, Paul Patras, and Hamed Haddadi. "Deep learning in mobile and wireless networking: A survey." IEEE Communications surveys & tutorials 21.3 (2019): 2224-2287.
References Books	(1) Clint Smith and Daniel Collins, 3G Wireless with 802.16 and 802.11, McGraw Hill Education
MOOC Courses	https://archive.nptel.ac.in/courses/117/102/117102062/
Videos	https://www.youtube.com/watch?v=CUyF0YGIA5Y

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	1	-	2	-	-	-	-	-	3	-	1	1	2	1
CO2	-	2	-	3	-	-	-	-	-	3	-	1	1	2	3
CO3	-	3	-	3	-	2	-	-	-	1	1	2	1	3	3
CO4	-	2	-	1	2	-	-	-	-	-	1	2	1	3	3
CO5	-	1	-	-	2	-	-	-	-	-	-	1	1	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-Electronics_and_Communication

Title of the Course	Principles of Sensors & IoT
Course Code	ECL0102[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic definitions, key terminologies of Sensors, Smart Sensors, & IoT. **(BL1-Remember)** **CO2-** To understand the working principles, concepts, & circuit designs of various sensors.**(BL2-Understand)** **CO3-** To apply that how to make Sensors by using different electronic components, apply an integrated knowledge on the Sensors, work with and interpret the data obtained from various sensor applications**(BL3-Apply)** **CO4-** To analyse various parameters of sensors using simulation or performing experiments on kits.**(BL4-Analyze)** **CO5-** Evaluate performance of sensors & actuators for various applications.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to Sensors: Sensors, Transducers, Difference between Sensor & Transducer, Different criteria to choose a sensor. Classification of Sensors: analog sensors, digital sensors, scalar sensors, vectored sensors. Need of Sensors. Temperature Sensors: Thermocouple- measuring principle and its applications, Resistive temperature detectors (RTD): used materials and construction and its applications. Thermistors: Principle and application. Comparison among Thermistor, Thermocouple, & RTD.	Audio, Video clip/Group discussion/Research/Field visit	12
2	Different types of Sensors: PIR sensor, Ultrasonic sensor, Gas Sensors, Proximity Sensor, Rain sensor, Touch Sensor, IR Sensor, Humidity Sensor, Semiconductor Sensors: working principle and its applications. Optical Sensors: Photodiodes, Photoresistor, PIN diode, Position Sensitive photo detectors, Pressure sensors. Chemical sensors: Electrochemical sensor, Amperometric and voltammetric sensors, potentiometric sensor, Bio sensors and applications	LectureAudio, Video clip/Group discussion/Research/Field visit	12
3	Smart Sensors and Actuators: Architecture of sensor node, Components of Sensor, Participatory Sensing, Wireless sensor motes and its applications: Mica2/MicaZ Motes, TelosB Motes, XM1000 wireless mote, Indriya, IRIS, iSense, Preon32, Wasp Mote, WiSense Mote, panStamp NRG Mote . Actuators: Principle, Types and Examples of Actuators, Sensor Data Communication Protocols.	Audio, Video clip/Group discussion/Research/Field visit	12
4	Internet of things (IoT): An Overview: Basics, definition and vision of IOT, IoT Conceptual Framework, IoT Architectural View, Physical Design of IoT, Logical Design of IoT, Applications of IoT. RFID: features, working principle, and applications.	Audio, Video clip/Group discussion/Research/Field visit	10
5	IoT Practical Applications: Definition & Essentials of IoT & IoT applications for: Home, Cities, Environment, Energy Systems, Retail, Logistics, Industry, Agriculture, Health & Lifestyle.	Audio, Video clip/Group discussion/Research/Field visit	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
4	IOT based Smart specs	PBL	BL6-Create	30
2	smart dustbin based on iot	PBL	BL6-Create	30
1	To familiarize with various sensors such as LM 35 Temperature Sensor, PIR Sensor, Soil Sensor, Thermistor Sensor.	Experiments	BL6-Create	2
1	To study characteristics of Platinum RTD (Resistance Temperature Detector) sensor	Experiments	BL6-Create	2
1	To study Characteristics of NTC Thermistor sensor.	Experiments	BL5-Evaluate	2
1	Study the Characteristics of K Type Thermocouple.	Experiments	BL6-Create	2
1	Study the characteristics of Pressure Transducer/ Sensor.	Experiments	BL6-Create	2
2	To make a touch sensor using 555 Timer IC on Breadboard	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1) Arshdeep Bahga and Vijay Madisetti Internet of Things – A Hand-on Approach Universities press, 2015 2) Shantanu Bhattacharya, A K Agarwal, Environmental, Chemical and Medical Sensors, Springer Nature Singapore Pvt. Ltd. 2018
Articles	10.1088/978-0-7503-2707-7ch1
References Books	1) Donald Norris, The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black, McGraw Hill Publication Raj Kamal, Internet of Things, TMH, New Delhi.
MOOC Courses	https://courses.mooc.fi/org/uh-cs/courses/introduction-to-the-internet-of-things-mooc
Videos	http://www.iot-a.eu/public NPTEL Lectures for Introduction to IoT

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	1	1	2	2	1	2	3	1	-	3	3	3
CO3	-	1	3	2	1	2	2	2	-	1	-	3	3	3	2
CO4	1	2	2	3	2	-	-	2	-	-	2	1	3	2	2
CO5	-	-	-	-	1	2	-	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-Electronics_and_Communication

Title of the Course	Architecturing of Smart IoT Devices
Course Code	ECL0304[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	1	1	5
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	To understand the contents and successfully complete this course, a participant must have a basic understanding of Sensors, Actuators, Interfacing of devices, Arduino IDE software and Hardware			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic definitions, key terminologies of Architecture of IoT, IoT architecture standards, Communication Technologies, Networking Technologies, IoT Protocols. **(BL1-Remember)** **CO2-** To understand the working principles, concepts, & circuit designs of various communication & Networking Technologies for IoT.**(BL2-Understand)** **CO3-** To apply that how to these technologies work with and interpret the data obtained from various IoT applications.**(BL3-Apply)** **CO4-** To analyse various IoT architecture reference models using simulation or performing experiments on IoT builder kit.**(BL4-Analyze)** **CO5-** Evaluate performance of IoT systems for various applications.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
I	IoT Architecture Reference Model (ARM): IoT an Overview, Evolution of IoT, Need for ARM, IoT conceptual framework, IoT Architectural view: reference model definition, IoT reference model by CISCO, Oracle's IoT structure, Major components of IoT devices: Physical objects, Hardware, Communication Module, Software, IoT software components for device hardware. Development tools and Open-source Framework for IoT Implementation, Platforms and Integration tools	Lecture Method/Video	12
II	Programming Raspberry Pi: Introduction to Raspberry Pi, Basic Architecture, Pin Configuration, Installation, Interfacing of Sensors, Interfacing of Actuators & Display Devices with Raspberry Pi & Programming concepts.	Lecture Method/Simulation	12
III	IoT Architecture standards: ETSI standard for IoT Architecture: Standards for IoT for Home, Energy, People, motion, City. IoT Communication Architecture: IoT nodes, IoT Edge, 6LOWPAN, IPv4/IPv6, MQTT, SMQTT, CoAP, XMPP, AMQP protocols	Lecture Method	10
IV	M2M Communication M2M Communication, M2M system Architecture: M2M device domain, M2M Network Domain, M2M application Domain, M2M applications, M2M software and development tools, Difference between M2M and IoT.	Lecture Method/Research	10
V	IoT Case studies Cloud computing, cloud computing services, how to send data on cloud platforms like thing speak, Blynk etc. IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.	Lecture Method/Case Study	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study IoT Builder kit & its sub system.	Experiments	BL2-Understand	2
1	To implement a GUI python program to control LED.	Experiments	BL4-Analyze	2
3	To implement a python program to interface DC Motor with IoT Development Kit.	Experiments	BL5-Evaluate	2
2	To interface python program control Stepper motor.	PBL	BL5-Evaluate	2
4	To send & Visualize data on Thing speak cloud Platform using NODE MCU.	PBL	BL5-Evaluate	2
3	Automation projects with data sent to cloud platforms	PBL	BL6-Create	30
5	Smart Healthcare Projects, Smart environment Projects	PBL		

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	Arshdeep Bahga and Vijay Madisetti Internet of Things – A Hand-on Approach Universities press, 2015
Articles	IEEE Standards Association Working Group for an Architectural Framework for the Internet of Things (IoT) (P2413) - http://grouper.ieee.org/groups/2413/
References Books	Donald Norris The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black McGraw Hill Publication.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc22_cs53/preview https://www.coursera.org/learn/iot-architecture https://www.coursera.org/learn/raspberry-pi-interface
Videos	http://www.iot-a.eu/public NPTEL Lectures for Introduction to IoT

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	-	-	3	-	-	-	-	1
CO2	3	2	1	-	-	2	-	-	-	3	-	-	2	-	2
CO3	1	2	1	3	2	-	-	-	-	-	-	-	2	2	2
CO4	1	2	1	3	-	-	-	-	-	-	-	-	3	3	3
CO5	1	2	-	2	-	-	-	-	-	-	-	-	2	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-Electronics_and_Communication

Title of the Course	Digital Electronics
Course Code	ECL0306[T]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems **(BL1-Remember)** **CO2-** To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations **(BL2-Understand)** **CO3-** To Apply simple logical operations using combinational logic circuits [BL3]**(BL3-Apply)** **CO4-** To analysis of combinational logic circuits, sequential logic circuits [BL4] **(BL4-Analyze)** **CO5-** To Evaluate to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines [BL5]**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
1	Digital Computer and Digital Systems, Number Systems & its Conversions, Complements, Binary codes, Binary Storage and Registers, Binary Logic, Integrated Circuits. Boolean Algebra–Definitions, Theorems, Properties & Function, Canonical and Standard Forms, Digital Logic Gates, Introduction to Digital Logic Families.	Audio video clip/Research/Field work/Group Discussion	12
2	The Map Method, Two and Three Variable Maps, Four Variable Maps, Five and Six Variable Maps, Product of Sums Simplification, NAND and NOR Implementation, Two Level Implementation, Don't–Care Conditions, Tabulation Method, Determination of Prime- Implicants, Selection of Prime- Implicants.	Audio video clip/Research/Field work/Group Discussion	12
3	Introduction, Design Procedure, Adders, Subtract or, Parity Generators, Code Conversion, Analysis Procedure, Multilevel NAND Circuits, Multilevel NOR Circuits, Exclusive-OR and Equivalence Functions, Magnitude Comparator, Decoder, Multiplexers, PLA.	Audio video clip/Research/Field work/Group Discussion	12
4	Introduction, Flip-Flops, Triggering of Flip-Flops–RS, J-K, T & D, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Flip-Flop Excitation Tables, Design Procedure, Design with State Equations, Registers, Shift, Registers, Counters.	Audio video clip/Research/Field work/Group Discussion/lecture method	10
5	Memory Organization: Memory Hierarchy, Secondary Memory, Main Memory Organization: Random access Memory (RAM), Read Only memory (ROM), Building large memories using small RAM and ROM chips,	Audio video clip/Research/Field work/Group Discussion/field visit	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study various Logic Gates and verify their truth tables.	Experiments	BL4-Analyze	2
4	To Study D & T Flip Flop and verify their truth tables.	Experiments	BL4-Analyze	2
1	To Verify Demorgan's Theorem and observe the output	Experiments	BL4-Analyze	2
3	To Study Half Adder, Full Adder and Half Subtractor and verify their truth tables	Experiments	BL4-Analyze	2
1	To study BCD to Excess-3 code convertor and verify its truth table.	Experiments	BL4-Analyze	2
3	To study and verify the truth table of 4-to-1 Line Multiplexer.	Experiments	BL4-Analyze	2
3	To study and verify the Truth Table of 1-to-4 Line Demultiplexer.	Experiments	BL4-Analyze	2
4	LED panel using seven segment	PBL	BL6-Create	30

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1) Digital Fundamentals by Morris and Mano, PHI Publication Fundamental of digital circuits by A.ANANDKUMAR,PHI Publication Digital Fundamaentals by FLOYD & JAIN, Pearsons Pub 2) Fundamentals of Logic Design by Charles H. Roth Thomson
Articles	https://www.researchgate.net/topic/Digital-Electronics
References Books	1) Leach and Malvino, Digital Principles and Applications, TMH 2) W.H. Gothman, Digital Electronics, PHI 3)Millman and Taub : Pulse, Digital and Switching Waveform, MGH
MOOC Courses	https://www.mooc-list.com/tags/digital-electronics
Videos	https://archive.nptel.ac.in/courses/108/105/108105132/

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	-	-	-	-	-	2	-	2	-	-	-
CO2	2	2	2	2	-	-	-	-	-	2	-	2	-	-	-
CO3	2	2	2	2	-	-	-	-	-	2	-	2	-	-	-
CO4	2	2	2	2	-	-	-	-	-	2	-	2	-	-	-
CO5	2	2	2	2	-	-	-	-	-	2	-	2	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-Electronics_and_Communication

Title of the Course	Electronics Circuits & Linear ICs Applications
Course Code	ECL0408[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	1	1	5
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To get familiarized with basic integrated circuit components, its designing & packaging.**(BL1-Remember)** **CO2-** Understanding various operating modes of Op-amp and its linear/non-linear applications**(BL2-Understand)** **CO3-** apply the concepts of transistors to understand the working of power amplifiers**(BL3-Apply)** **CO4-** To analyze various operational amplifier circuits.**(BL4-Analyze)** **CO5-** To evaluate the performance of various types of active filters and their design**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger)				

Part B

Modules	Contents	Pedagogy	Hours
1	Integrated Circuits: Analog and Digital Integrated Circuits, Characteristics, Advantages and disadvantages of Analog and digital Integrated Circuits. Current Mirrors: Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror.	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	Operational amplifier (IC741), specifications, ideal and practical characteristics, frequency response, unity gain bandwidth, Inverting and non-inverting configurations, difference amplifier, Effect of finite open loop gain and bandwidth on circuit performance, Large signal operation of op-amp, Current to Voltage Converter, Voltage to Current Converter, Instrumentation Amplifier.	Lecture Method/ Case Study/ Video/ Group Discussion	12
3	Non-Linear applications of IC Op-amps: Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Sample and Hold Circuits, Analog Multipliers and their applications, Op-amp as a comparator, Zero crossing detectors, Schmitt Trigger, Astable multi vibrator, Mono stable multi vibrator, Generation of Triangular Waveforms.	Lecture Method/ Case Study/ Video/ Group Discussion	12
4	Filters: Active and Passive Filters, First and second order Low Pass, High Pass, Band Pass, Band Reject and All pass active filters. Integrated Circuit Timer: The 555 Circuit, implementing a Mono stable Multi vibrator Using the 555 IC, Astable Multi vibrator Using the 555 IC.	Lecture Method/ Case Study/ Video/ Group Discussion	10
5	Phase Locked Loop: VCO, Block diagram of PLL, Working of PLL and its applications. Power amplifier: Introduction, types, Class A, Class B, Class-AB, Class C, Class D amplifiers.	Lecture Method/ Case Study/ Video/ Group Discussion	10

<4d style="border: 1px solid black;">Experiments

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
4	mouse tracker circuit using 555 timer	PBL	BL6-Create	30
1	To study different applications of Operational Amplifier: Voltage follower, Integrator and differentiator	Experiments	BL5-Evaluate	2
1	To study Op-Amp. as Comparator and Zero Crossing Detector.	Experiments	BL5-Evaluate	2
1	To study and design Schmitt Trigger using an Op-Amp.	Experiments	BL5-Evaluate	2
1	To study and measure the Input Offset Voltage, Input Bias Currents, Input Offset Current, and Slew Rate of an Op-Amp.	Experiments	BL5-Evaluate	2
4	To study Mono stable Multi vibrator using IC 555.	Experiments	BL5-Evaluate	2
4	To study Astable Multi vibrator using IC 555.	Experiments	BL5-Evaluate	2
4	To study and design second order Low Pass Butterworth Filter.	BL5-Evaluate	2	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1) Ramakant A. Gayakwad, Op Amps and Linear Integrated Circuits, Prentice Hall Publications 2)Integrated Electronics: Analog and Digital Circuits & Systems by Chetan D. Parikh, Christos C. Halkias, and Jacob Millman
Articles	https://ieeexplore.ieee.org/document/1082512
References Books	1) Sedra and Smith, Microelectronics circuits, Fifth edition by Oxford University Press.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc24_ee73/preview
Videos	https://archive.nptel.ac.in/courses/108/108/108108111/

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	2	-	-	-	-	-	3	-	-	-	-	3
CO2	-	2	-	2	-	-	-	-	-	3	-	-	-	-	3
CO3	-	2	-	3	-	-	-	-	-	1	1	1	-	-	3
CO4	-	1	-	1	-	-	-	-	-	-	1	1	-	-	3
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-Electronics_and_Communication

Title of the Course	Digital System Design
Course Code	ECL0409[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	1	1	5
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various concept of Digital system design**(BL1-Remember)** **CO2-** Understand the digital systems as an activity in a larger systems design context**(BL2-Understand)** **CO3-** Apply the concept of digital system design**(BL3-Apply)** **CO4-** Analyze the concept of digital system design**(BL4-Analyze)** **CO5-** Evaluate Programmable logic devices (PLDs) and networks of arithmetic operations.B**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger)				

Part B

Modules	Contents	Pedagogy	Hours
1	Synthesis and Analysis of Synchronous Sequential Circuits: Introduction, Characterizing Equation and Description of Synchronous Sequential Machine, Realization of Flow Table from Verbal Description Moore & Mealy Models or Machines, Machines State Table and Transition Diagram, Designing of Synchronous Sequential Circuits-Sequence Detector etc., Minimization of Flow Table of Completely and Incompletely Specifies Sequential Machines	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	Introduction, Fundamental Concept of Hardware / Firmware Algorithms, ASM Chart, Timing Considerations, Control Implementation, Design with Multiplexers, PLA Control.	Lecture Method/ Case Study/ Video/ Group Discussion	12
3	Basic Components of a Computer, Specifications, Architecture of a Simple Microcomputer System, Programmable Logic Devices: PROM, PLE, PLAs, PALs, GAL, PEEL, CPLDs and FPGA. Design Implementation using CPLDs and FPGAs.	Lecture Method/ Case Study/ Video/ Group Discussion	12
4	Basic Components of a Computer, Specifications, Architecture of a Simple Microcomputer System, Programmable Logic Devices: PROM, PLE, PLAs, PALs, GAL, PEEL, CPLDs and FPGA. Design Implementation using CPLDs and FPGAs	Lecture Method/ Case Study/ Video/ Group Discussion	10
5	Introduction to Computer-Aided Design Tools for Digital Systems Hardware Description Languages, Introduction to VHDL & Verilog, Data Objects, Classes and Data Types, Operators, Overloading, Logical Operators. Types of Delays Entity and Architecture Declaration. Introduction to Behavioral, Dataflow and Structural Models	Lecture Method/ Case Study/ Video/ Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	1. To implement RS Flip Flop using NAND gates and verify their truth tables.	Experiments	BL5-Evaluate	2
1	2. To implement JK Flip Flop using NAND gates and verify their truth tables	Experiments	BL5-Evaluate	2
1	3. To implement D and T Flip Flop using NAND gates and verify their truth tables	Experiments	BL5-Evaluate	2
1	4. To implement Master Slave JK Flip-Flop and verify its truth table	Experiments	BL5-Evaluate	2
1	5. Design and verify the Asynchronous Counter (Ripple Counter)	Experiments	BL5-Evaluate	2
1	6. To implement a Ring Counter using Flip-Flops	Experiments	BL5-Evaluate	2
1	7. To implement a Johnson Ring Counter using Flip-Flops	Experiments	BL5-Evaluate	2
1	Visitor counter using arduino	PBL	BL6-Create	30

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1) R.P. Jain, Modern Digital Electronics, Tata Mc Graw Hill Company Limited.
Articles	1) Comparative study of Moore and Mealy machine models adaptation in black soap production 10.4314/njt.v36i2.36
References Books	1) Morries Mano,, Digital Logic Design, PHL
MOOC Courses	https://www.coursera.org/learn/electronica-digital-bit-a-bit-disenando-circuitos-complejos
Videos	https://onlinecourses.nptel.ac.in/noc21_ee39/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-2	1	-	-	-	-	-	1	-	3	2	1	-
CO2	3	3	3	1	-	-	-	-	-	1	-	-3	3	1	-
CO3	3	3	2	1	-	-	-	-	-	1	-	3	2	1	-
CO4	3	3	2	1	-	-	-	-	-	1	-	3	3	1	-
CO5	3	3	2	1	2	-	-	-	-	1	-	3	3	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-Electronics_and_Communication

Title of the Course	Web Technologies
Course Code	ECO0701B [T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	0	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To teach students the basics of server side scripting using PHP**(BL1-Remember)** **CO2-** To explain web application development procedures**(BL2-Understand)** **CO3-** To impart servlet technology for writing business logic**(BL3-Apply)** **CO4-** . To facilitate students to connect to databases using JDBC**(BL4-Analyze)** **CO5-** To evalute various concepts of application development using JSP**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	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., Handling File Uploads, Connecting to database (My SQL as reference), executing simple queries, handling results, Handling sessions and cookies. File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	Introduction to JavaScript: JavaScript language – declaring variables, scope of variables functions, event handlers (on click, on submit etc.), Document Object Model, Form validations. Simple AJAX applications.	Lecture Method/ Case Study/ Video/ Group Discussion	12
3	Introduction to XML, Defining XML tags, their attributes and values, Document type definition, XML Schemas, Document Object model, XHTML Parsing XML Data - DOM and SAX parsers in java	Lecture Method/ Case Study/ Video/ Group Discussion	12
4	Common Gateway Interface (CGI), Lifecycle of a Servlets, deploying a Servlets, The Servlets API, Reading Servlets parameters, Reading initialization parameters, Handling Http Request & Responses, Using Cookies and sessions, connecting to a database using JDBC	Lecture Method/ Case Study/ Video/ Group Discussion	10
5	The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session tracking, connecting to database in JSP	Lecture Method/ Case Study/ Video/ Group Discussion	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1) Web Technologies, Uttam K Roy, Oxford University Press 2) The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill
Articles	https://ieeexplore.ieee.org/document/1232045
References Books	1)Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dremtech 2)Java Server Pages – Hans Bergsten, SPD O'Reilly
MOOC Courses	https://onlinecourses.swayam2.ac.in/nou24_cs09/preview
Videos	https://onlinecourses.swayam2.ac.in/nou24_cs09/preview

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	-	-	-	-	-	-	3	2	-	-
CO2	2	3	2	2	3	-	-	-	-	-	-	3	3	-	-
CO3	2	3	2	2	3	-	-	-	-	-	-	3	3	-	-
CO4	2	3	2	2	3	-	-	-	-	-	-	3	3	-	-
CO5	2	3	2	3	3	-	-	-	-	-	-	3	2	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-Electronics_and_Communication

Title of the Course	Communication Skills & Colloquium
Course Code	HUL0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s	Student must have knowledge about Language proficiency.			**Co-Requisite/s**	1.Developed Communication skills. 2.Career Development workshop			
Course Outcomes & Bloom's Level	**CO1-** Comprehend and summarize characteristics & various structural principlesprerequisite to Technical Communication ((**BL1-Remember)** **CO2-** Classify and formulate the elementary intricacies of Scientific and Technical Writing using application grammar construct.**(BL2-Understand)** **CO3-** Create cohesive technical paragraphs & text.**(BL3-Apply)** **CO4-** Paraphrase text(s) and use appropriate referencing styles**(BL4-Analyze)** **CO5-** Evaluate the significance of Formal Writing**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Module-1	Introduction to Communication Skills, Objectives, Significance of Communication, Flow of Communication, Principles Communication, Essential Features, Process of Communication, Verbal (Oral & Written) and Non-verbal Communication, Barriers to Effective Communication, Introduction to Technical Communication, Major Difference between Technical Communication and General Communication.	Audio/Video clips, group discussion, Lecture Method	6
Module-2	Introduction & Significance of Listening skills, Types of Listening, Barriers in Effective Listening, Basic Grammar - Parts of Speech, Active Passive and Articles.	Audio/Video clips, group discussion, Lecture Method	6
Module-3	Introduction to Formal Letter Writing, Elements of Letter Writing and Style of Writing, Layout & Structure of Formal Letter Writing, Introduction to the Types of Business Letters- Enquiry, Calling Quotations, Order,Complaint and Adiustment.Introduction to Employment Communication- Job Application, Writing Resume, Differences among Resume, Curriculum Vitae & Bio-data.	Audio/Video clips, group discussion, Lecture Method	6
Module-4	Introduction to Oral Presentations, Objectives, Significance and Approach, Preparation and Delivery of Oral Presentation (topics to be selected by the teachers). Introduction to Interview Skills. How to Develop Interview Skills. Dos and Don't of Interviews, Types of Interviews, Reviewing TV Program/Book/News Paper Articles etc.	Audio/Video clips, group discussion, Lecture Method	6
Module-5	Introduction to Report Writing, Major Objectives of Writing Reports, Significance of Business/Technical, Types and Forms of Reports, Styles of Writing Reports- Printed Format, Memo Format, Letter Format, Book/Letter Text Format. Layout and Structure of Reports, Components of Reports, Writing	Audio/Video clips, group discussion, Lecture Method	6

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Unit 1	Soft Skills	PBL	BL2-Understand	6
Unit 2	Basics of Communication	PBL	BL3-Apply	6
Unit 3	Letter Writing	PBL	BL3-Apply	6
Unit 4	Active Passive	PBL	BL4-Analyze	6
Unit 5	Rport Writing	PBL	BL5-Evaluate	6

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	

Part E

Books	1. Essentials of Business Communication with Student CD-ROM by Mary Ellen Gufley, Paperback: SIl pages, Publisher: South-Western Educational 2. Business Communication: Building Critical Skills by Kitty O. Locker, Stephen Kyo Kazmarek, Hardcover: 637 pages, Publisher: Irvin/McGraw-Hill
Articles	https://www.jetir.org/papers/JETIR2108373.pdf https://open.lib.umn.edu/communication/chapter/1-2-the-communication-process/ https://www.iosrjournals.org/iosr-jbm/papers/Vol22-issue8/Series-2/E2208024254.pdf
References Books	1. Business Communication Today by Courtland L. Bovee, John V. Thill, Barbara E. Schatzman, Hardcover: 730 pages, Publisher: Prentice Hall. 2. Excellence In Business Communication (6th Edition) by John Thill, Courtland L. Bovee, Paperback: 656 pages, Publisher: Prentice Hall.
MOOC Courses	http://www.digimat.in/nptel/courses/video/109104031/L01.html
Videos	http://www.digimat.in/nptel/courses/video/109104031/L01.html

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	2	-	2	2	-	-	-	2	-	-	1	-	1
CO2	2	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	1	1	-	1	-	-	-	-	2	-	-	3	2	3
CO4	3	2	-	2	1	-	-	-	-	2	-	-	2	3	3
CO5	3	2	-	2	1	-	-	-	-	2	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Essentials of Information Technology
Course Code	CSL0201

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	0	2	4
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s	To understand the contents and successfully complete this course, a participant must have a basic understanding of Basics of Computer system, Storage Systems, Operating systems, Networking and Database.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the basics of Computer systems like types, I/O devices, storage of computer systems (Knowledge, Understand)**(BL1-Remember)** **CO2-** Apply the various networking concepts, topologies and remove deadlocks. (Apply).**(BL2-Understand)** **CO3-** Explain various memory management techniques and Analyze the concept of Sub-programs and blocks (Analysis)**(BL3-Apply)** **CO4-** Design the concept of software, operating system for better utilization of external system (Design)**(BL4-Analyze)** **CO5-** Evaluating the various algorithm, its solution and other communication techniques. (Investigation).**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕			**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG8(Decent work and economic growth) SDG9(Industry Innovation and Infrastructure)			

Part B

Modules	Contents	Pedagogy	Hours
1	Computer Basics: Basics of Computer Systems(T1,T2), Evolution of Computers, Computer Generations, Classification of Computers(T1,T3), Computer Applications, Interaction between User and Computer(T7). Hardware Components, Basic Computer Organization, Input and Output Devices(T1,T3), Central Processing Unit(T1), System Bus Architecture, Memory or Storage Unit	White Board, PPT	6
2	Operating System: Introduction to Operating System, Function of Operating Systems(T1), Working Knowledge of GUI-Based Operating System (T3,T4), Working with latest version of Windows(T3,T4). Various Operating Systems, Evaluation of Operating System(T3,T4,T,7), Virtual Machine, Operating Systems for Mobile, Installation of Operating System(T1,T3,T4), Boot Process.	White Board, PPT	6
3	Computer Networks and World Wide Web: Introduction to Computer Networks (LAN, MAN, WAN, PAN)(T3,T4), Network Topologies, Ethical Issues related to Network Security(T2,T3). Internet and World Wide Web(T7,T8), Internet Evolution(T1), FTP, Electronic Mail, Search Engines(T1), Introduction to HTML, Static and Dynamic Web Pages	White Board, PPT	6
4	Computer Software: Introduction, System Software(T1,T3), Application Software, Firmware(T3), Software Installing and Uninstalling(T3,T4), Software Development Steps, Characteristics of good software(T1,T7), Usability of software, Introduction to Free and Open Source Software(T3,T4), Introduction to Database Management System	White Board, PPT	6
5	Subprograms and Blocks: Problem Solving: Flow Charts(T3,T4), Tracing Flow Chart, Algorithms. Fundamentals of sub-programs(T1,T3,T4), Scope of life time of variables, static and dynamic scope(T7), design issues of subprograms and operations, parameter passing methods(T3,T4), overloaded sub-programs, generic sub-programs(T1,T3), design issues for functions user defined overloaded operators	White Board, PPT	6

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Explain the Installation process of Operating system and its Memory Management.	Experiments	BL2-Understand	10
2-3	Design of a Web Page which describe your Biodata.	PBL	BL3-Apply	10
4-5	Describe Software development life cycle (SDLC) with all components.	PBL	BL5-Evaluate	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	20	60	0

Part E

Books	P. K. Sinha, Priti Sinha; Computer Fundamentals; BPB Publication. V. Rajaraman; Fundamentals of Computers; Prentice Hall of India Publication. G. G. Wilkinson; Fundamentals of Information Technology; Wiley-Blackwell Publishing. Yashwant P. Kanetkar; Let Us C; BPB Publication.
Articles	
References Books	E. Balagurusamy; Programming in ANSI C; Tata McGraw-Hill Publishing. Ron Mansfield; Working in MS-Office; Tata McGraw Hill Publishing.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	1	1	2
CO2	1	2	-	-	-	-	-	-	-	-	-	-	3	3	2
CO3	-	-	1	-	-	-	-	-	-	-	-	-	3	2	2
CO4	-	-	-	2	-	-	-	-	-	-	-	-	2	2	2
CO5	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Object Oriented Programming by Java
Course Code	CSP0303

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					0	0	4	4
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic principles of the object-oriented programming **(BL1-Remember)** **CO2-** Understand the basic concept of the object-oriented programming **(BL2-Understand)** **CO3-** Apply the logic of oops in java **(BL3-Apply)** **CO4-** Able to Analyze inheritance and abstraction **(BL4-Analyze)** **CO5-** Demonstrate an introductory understanding of graphical user interfaces, multithreaded programming, and event-driven programming**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
1	Objects and Classes: Introduction of Eclipse software ,Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, File, this reference	Lecture Method/ Case Study/ Video/ Group Discussion	12
2	Inheritance: Inheritance in java, Super and sub class, Overriding, Object class,.	Lecture Method/ Case Study/ Video/ Group Discussion	12
3	Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.	Lecture Method/ Case Study/ Video/ Group Discussion	12
4	Abstract class, Interface in java, Package in java, UTIL package., encapsulated	Lecture Method/ Case Study/ Video/ Group Discussion	10
5	I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files	Lecture Method/ Case Study/ Video/ Group Discussion	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Program to define a structure of a basic JAVA program	Experiments	BL4-Analyze	2
2	Program to define student class with user input	Experiments	BL4-Analyze	2
3	Program to define student class without user input	Experiments	BL4-Analyze	2
4	Program to define class and constructors	Experiments	BL4-Analyze	2
5	Program to define class, methods and objects. Demonstrate method overloading.	Experiments	BL4-Analyze	2
6	Program to define inheritance and show method overriding.	Experiments	BL4-Analyze	2
7	Program to define inheritance with .superclass	Experiments	BL4-Analyze	2
8	Program to define abstraction	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	1) Daniel Liang, Seventh Edition, Pearson, introduction to Java Programming(Comprehensive Version) Seventh Edition, Pearson.
Articles	https://www.irjet.net/archives/V7/i10/IRJET-V7I10247.pdf
References Books	1) Sachin Malhotra & Saurabh Chaudhary, Programming in Java Oxford University Press.
MOOC Courses	https://www.coursera.org/courses?query=object%20oriented%20programming
Videos	https://archive.nptel.ac.in/courses/106/105/106105153/

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	2	-	-	-	-	-	-	2	2	2
CO2	1	1	-	2	2	2	-	-	-	-	-	-	2	2	3
CO3	2	1	1	-	1	-	-	-	-	-	-	-	2	3	2
CO4	2	1	1	2	1	-	-	-	-	-	-	-	3	2	3
CO5	1	-	-	2	1	-	-	-	-	-	-	-	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Analog & Digital Communication
Course Code	ECL0427

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	1	1	5
Course Type	Embedded theory and lab							
Course Category	Disciplinary Minor							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** comprehensive knowledge of analog and digital communication; **(BL1-Remember)** **CO2-** understand the modulation and demodulation technologies and apply whenever essential.**(BL2-Understand)** **CO3-** have a practical experience of different communication technologies and can identify and analyze**(BL3-Apply)** **CO4-** practical experience of communication methods and evaluate different process.**(BL5-Evaluate)** **CO5-** develop different project based works and fond solutions**(BL3-Apply)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction:Overview of Communication system, Communication channels Need for modulation, Baseband and Pass band signals.Noise: Internal & External Noise, Signal to Noise ratio, Noise Figure, Calculation of Noise. Amplitude Modulation: Double side band with Carrier (DSB-C), Double side band without Carrier, Single Side Band Modulation, DSB-SC, SSB Modulators and Demodulators, Vestigial Side Band (VSB).	Talks and presentations	12
2	Angle Modulation: Angle Modulation; FM and PM waveforms, phase deviation, frequency deviation, modulation index, phase and frequency modulators and demodulators, frequency spectrum of angle modulated waves, bandwidth requirement for angle modulated waves, Average power of angle modulated waves, direct and indirect FM transmitters, FM Receivers, Angle Vs Amplitude modulation, FM Vs PM, FM noise suppression.	Talks and presentations	13
3	Pulse Modulation and Waveform Coding Techniques: Pulse Modulation Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width modulation, Pulse Position Modulation. Their generation and Demodulation, Digital representation of Analog Signals, Pulse Code Modulation (PCM), PCM System, Differential Pulse Code Modulation.	Talks and presentations	11
4	Digital Modulation and Demodulation Techniques: Digital Data transmission, Line coding review, Pulse shaping, Scrambling, Digital receivers, Method of generation and detection of coherent & non- coherent binary ASK, FSK & PSK, Differential phase shift keying, quadrature modulation techniques. (QPSK and MSK), M-ary Digital carrier Modulation.	Talks and presentations	12
5	Information Theory & Coding: Information, entropies(Marginal and Conditional), Model of a communication system, Mathematical representation of source, channel and receiver characteristics, Mutual information, channel capacity, efficiency of noise free channel , Binary symmetric channel(BSC), Binary erasure channel(BEC), Shannon theorem, Shannon –Hartley Theorem, Shannon Fano and Huffman coding methods and their efficiency, Error control coding, Minimum Hamming distance, Linear block code, Cyclic code and Convolution codes.	Talks and presentations	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	1	1	-	-	-	-	1	1	2	2	2
CO2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	3
CO3	1	1	1	1	1	1	-	-	-	-	1	1	2	3	2
CO4	1	1	1	1	1	1	-	-	-	-	1	1	3	2	3
CO5	1	1	1	1	1	1	-	-	-	-	1	-	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Mini Project
Course Code	EED 0603

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					0	0	4	4
Course Type	Project							
Course Category	Projects and Internship							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Examine and cultivate a cognitive approach for delivering a presentation.**(BL2-Understand)** **CO2-** Enhance his linguistic and communicative abilities. **(BL3-Apply)** **CO3-** romote collaboration by cultivating an understanding of alternative perspectives.**(BL4-Analyze)** **CO4-** Stay updated on the most recent advancements in electrical engineering.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Major project-I
Course Code	EED0704

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Project							
Course Category	Projects and Internship							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Utilize contemporary tool sets to simulate and verify utilizing experimental methods whenever possible.**(BL3-Apply)** **CO2-** . Verify and examine the outcomes by utilizing various case studies.**(BL4-Analyze)** **CO3-** Make logical deductions and draw significant conclusions that are suitable for publication.**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Major Project
Course Code	EED0804

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					0	0	8	8
Course Type	Project							
Course Category	Projects and Internship							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Utilize contemporary tool sets to simulate and verify utilizing experimental methods whenever possible. **(BL3-Apply)** **CO2-** Verify and examine the outcomes by utilizing various case studies. **(BL5-Evaluate)** **CO3-** Make logical deductions and draw significant conclusions that are suitable for publication.**(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG3(Good health and well-being) SDG4(Quality education) SDG6(Clean water and sanitation) SDG7(Affordable and clean energy) SDG11(Sustainable cities and economies) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Home Automation System	PBL	BL6-Create	120
2	Arduino Radar Model	PBL	BL6-Create	120
3	DC motor speed control wireless	PBL	BL6-Create	120

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	-	-	-	-	-	1	1	3	2	2
CO2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	2
CO3	1	1	1	1	-	-	-	-	-	-	1	1	2	2	2
CO4	1	1	1	1	1	-	-	-	-	-	1	1	3	2	3
CO5	1	1	1	1	1	-	-	-	-	-	1	1	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Power System Protection
Course Code	EEL 0643

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					0	0	1	1
Course Type	Embedded theory and lab							
Course Category	Disciplinary Major							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** understand the scenario and structure of power system**(BL1-Remember)** **CO2-** set up the substation and its maintenance, power station maintenance **(BL2-Understand)** **CO3-** Predict the behavior of any electrical circuits, Formulate and solve complex Three phase AC circuits.**(BL5-Evaluate)** **CO4-** can evaluate the power generation value, transmission and distribution system capacity**(BL5-Evaluate)** **CO5-** Able to understand basics on power system protection system**(BL2-Understand)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG8(Decent work and economic growth) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	To study Characteristics of solid state Over Voltage/Under Voltage Relay	Experiments	BL4-Analyze	2
2	To study Characteristics of Static Type over current Relay	Experiments	BL4-Analyze	2
3	UNDER VOLTAGE RELAY STATIC TYPE	Experiments	BL4-Analyze	2
4	TO STUDY IDMT OVER CURRENT RELAYS SINGLE PHASE AND TO DETERMINE THE PICKUP AND RESET VALUE.	Experiments	BL4-Analyze	2
5	TO STUDY LINE TO LINE FAULT	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	20	60	30

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	-	1	-	1	-	-	-	-	1	1	1	1	3
CO2	1	1	1	-	1	1	-	1	-	-	1	1	2	2	1
CO3	1	-	1	1	1	-	1	-	-	-	1	-	1	1	1
CO4	1	1	1	1	1	1	1	-	-	-	1	1	2	1	3
CO5	1	1	1	-	1	1	1	-	-	-	1	-	2	2	3
CO6	1	1	1	1	1	-	1	-	-	-	-	1	3	2	1

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Introduction of Electric Vehicle Technology
Course Code	EEL0132

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Identify EV concepts and parameters for better understanding of the EV technology**(BL1-Remember)** **CO2-** Analyze the EV Propulsion system for vehicular applications for their control.**(BL2-Understand)** **CO3-** Identify different energy sources used in EV.**(BL3-Apply)** **CO4-** Identify concepts of renewable energy sources**(BL4-Analyze)** **CO5-** Identify various alternative energy sources of energy.**(BL2-Understand)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
I	Introduction to transportation, Emissions from Vehicle, Evolution of e- mobility, EV Ecosystem and e-mobility in India, current demand in EV industry and opportunities of skilled EV engineers Past, Present & Future of EV, Current Major Issues, Recent Development Trends,	talks and presentations	8
II	Basic concepts related to EV, Types of Electric Vehicles in use today – Battery Electric Vehicle, Hybrid (ICE & others), Fuel Cell EV, Solar Powered Vehicles. Social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.	talks and presentations	9
III	Conventional and Non-conventional sources of energy Conventional energy sources. Non-conventional energy sources. Need of non-conventional energy sources. Renewable Sources of Energy such as Hydro, Solar, Wind, Biomass, Tidal and Geothermal - their availability and limitations.	talks and presentations, quiz	10
IV	Solar constants, Measurement of solar radiations, Solar Energy Conversion CSP generators, construction and working principle construction of a solar PV Systems: Solar cell, Module, Panel and array Types of solar PV system i. Stand –Alone Solar PV system ii. Grid-Interactive solar PV system iii. Hybrid Solar PV system Grid connection issues of solar power plants	talks and presentations, field visits	10
V	Indian & Global Scenarios in Electric Vehicles Technology Scenario, Market Scenario, Policies & Regulations, Payback & Commercial Model, Policies in India	talks and presentations	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
II	Study of electric vehicle system	Experiments	BL2-Understand	2
II	Study of hybrid electric vehicle system.	Experiments	BL4-Analyze	2
IV	Solar based EV Charging station.	Experiments	BL5-Evaluate	2
III	Electric Rickshaw Motor kit	Experiments	BL3-Apply	2
IV	Demonstration of battery management System	Experiments	BL4-Analyze	2
III	Demonstration of Brushless DC motor-based EV	Experiments	BL3-Apply	2
IV	To study about solar photo-voltaic system	Experiments	BL2-Understand	2
III	To study about solar lightning	Experiments	BL3-Apply	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1.Ali Emadi, “Advanced Electric Drive Vehicles”, CRC Press 2.Iqbal Husain, “Electric and Hybrid Vehicles – Design Fundamentals”, Second Edition, CRC Press.
Articles	E. Karden, S. Ploumen, B. Fricke, T. Miller and K. Snyder, “Energy storage devices for future hybrid electric vehicles,” J. Power Sources, vol. 168, no. 1, pp. 2–11, 200
References Books	1.Alfred Rufer, “Energy Storage systems and components”, CRC Press
MOOC Courses	1.https://nptel.ac.in/courses/108106170 Institute Logo NOC:Fundamentals of Electric vehicles: Technology & Economics, IIT Madras Prof. Ashok Jhunjhunwala Prof. Prabhjot Kaur Prof. Kaushal Kumar Jha Prof. L Kannan 2.https://onlinecourses.nptel.ac.in/noc22_ee53/preview Electric Vehicles - Part 1 By Prof. Amit Jain | IIT Delhi
Videos	1.https://www.youtube.com/watch?v=CWulQ1ZSE3c 2.https://www.youtube.com/watch?v=UgtjRob5qMg&list=PLyqSpQzTE6M9spod-UH7Q69wQ3uRm5thr

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	-	-	-	-	1	-	-	1	-	1	-	-
CO2	-	1	-	1	-	1	1	-	2	-	-	-	-	-	1
CO3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	-	1	-	-	-	-	2	-	-	-	-	-	-	1	-
CO5	2	-	1	-	-	-	-	-	1	1	-	-	-	-	-
CO6	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Architecture of Electric Vehicle and solar Panels
Course Code	EEL0233

Part A

Year	1st	**Semester**	2nd	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basic understanding of EV & HEV			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Identify various types of EV's and their characteristics**(BL1-Remember)** **CO2-** Describe battery basics and their types in EV and HEV.**(BL2-Understand)** **CO3-** Identify various types of electrical machines used in EV installation.**(BL3-Apply)** **CO4-** Describe Solar panel design and integration. **(BL4-Analyze)** **CO5-** Identify installation and commissioning of solar panel.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
I	Battery electric vehicles, The IC engine/electric hybrid vehicle, fuelled electric vehicles, Electric vehicles using supply lines, Solar powered vehicles, Electric vehicles which use flywheels or super capacitors, Electric Vehicles for the Future	talks and presentations	8
II	Electric Vehicle Operation, Battery Basics, Introduction to Electric Vehicle Batteries, Fuel Cell Technology, Choice of a Battery, ElectricVehicle Body and Frame, Fluids, Lubricants, and Coolants, Effects of Current Density on Battery Formation, Effects of Excessive Heat on Battery Cycle Life, Battery Storage, Battery Capacity	talks and presentations, PBL	8
III	Real-Time Model of a Two-Phase PMSM, PM Brushless DC Machine for EV, Switched Reluctance Motor (SRM) uses in EV, Synchronous Reluctance Motor (SyRM) for EV and HEV, Linear Induction Motor (LIM) – Construction, DC Linear Motor (DCLM) for EV, Analyze the control aspects of brushless DC motor	talks and presentations	9
IV	Solar Radiation Energy Measurements, Estimating Energy requirement, Types of Solar PV System, Design methodology for SPV system, Design of Off Grid Solar Power Plant, Case studies of 3KWp Off grid Solar PV Power Plant, Design and Development of Solar Street Light and Solar Lantern, Off Grid Solar power Plant	talks and presentations, Field visits	8
V	Installation and Trouble shooting of Standalone Solar PV System, Maintenance of Solar PV System, Safety in installation of Solar PV System, Maintenance of Solar PV System. Installation, Commissioning, Trouble shooting of 1KWp off Grid Solar Power Plant, Check list for Solar PV Plant Installation and Commissioning	talks and presentations, PBL	10

<4d style="border: 1px solid black;">Experiments

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Familiarization of EV control Modules	Experiments	BL2-Understand	2
I	Study of observer design for EV	Experiments	BL3-Apply	2
III	PI and PID controller for EV	Experiments	BL4-Analyze	2
III	Speed control of DC shunt machine for EV	Experiments	BL5-Evaluate	2
II	Speed control of Induction machine for EV	Experiments	BL5-Evaluate	2
IV	To plot V-I characteristics of solar cell and determine the fill factor	Experiments	BL5-Evaluate	2
IV	Series and parallel connections of solar cells	Experiments	BL5-Evaluate	2
V	Testing of photovoltaic cells	BL5-Evaluate	2	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1. Vehicle Powertrain Systems by Behrooz Mashadi and David Crolla, Wiley, 2012 2. Automotive Aerodynamics by Joseph Katz, Wiley, 2016 3. Automotive Chassis Engineering, by David C. Barton and John D. Fieldhouse, Springer, 2018 4. Automotive Engineering Powertrain, Chassis System and Vehicle Body Edited by David A. Crolla, Elsevier,2009 5. Automotive Power Transmission Systems by Yi Zhang and Chris Mi, Wiley, 2018 6. Linear Electric Machines, Drives, and MAGLEVs Handbook, by Ion Boldea, CRC Press. 2013
Articles	
References Books	1.Encyclopaedia of Automotive Engineering edited by David Crolla et al, Wiley, 2014 2. Design and Control of Automotive Propulsion Systems by Zongxuan Sun and Guoming Zhu, CRC Press, 2015 3. The Automotive Transmission Book by Robert Fischer, Ferit Küçükay, Gunter Jürgens, Rolf Najork, and Burkhard Pollak, Springer, 2015 4. Noise and Vibration Control in Automotive Bodies by Jian Pang, Wiley, 2019
MOOC Courses	1.https://onlinecourses.nptel.ac.in/noc22_ee53/preview Fundamentals of Electric vehicles: Technology & Economics, IIT Madras Prof. Ashok Jhunjhunwala Prof. Prabhjot Kaur Prof. Kaushal Kumar Jha Prof. L Kannan 2.https://nptel.ac.in/courses/108106170 Electric Vehicles - Part 1 By Prof. Amit Jain | IIT Delhi
Videos	1.https://www.youtube.com/watch?v=UgtjRob5qMg&list=PLyqSpQzTE6M9spod-UH7Q69wQ3uRm5thr 2.https://www.youtube.com/watch?v=mNOYS-duUJY

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	1	-	1	-	-	1	-	-	-	-	1	-
CO2	-	-	1	-	-	-	1	-	-	1	-	2	-	-	-
CO3	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	1	-	2	-	2	-	-	-	-	-	-	1
CO5	-	-	2	-	-	-	-	-	-	-	1	-	1	-	-
CO6	2	-	-	-	1	-	-	-	3	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Energy Storage Systems for electric vehicles
Course Code	EEL0334

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	0	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basics of vehicle mechanism			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the basic history of electric vehicles.**(BL1-Remember)** **CO2-** Discuss the various energy storage systems**(BL2-Understand)** **CO3-** Analyze the battery characteristics & parameters**(BL3-Apply)** **CO4-** Enlighten the battery management system**(BL5-Evaluate)** **CO5-** Apply the knowledge battery testing, disposal & recycling to avoid environmental pollution for the betterment of society**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG9(Industry Innovation and Infrastructure) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
I	Energy storage systems overview - Scope of energy storage, needs and opportunities in energy storage, Technology overview and key disciplines, comparison of time scale of storages and applications, Energy storage in the power and transportation sectors. Importance of energy storage systems in electric vehicles, Current electric vehicle market.	talks and presentations	7
II	Batteries: Lead Acid Battery, Nickel based batteries, Sodium based batteries, Lithium based batteries – Li-ion & Li-poly, Metal Air Battery, Zine Chloride battery; Ultra capacitors; Flywheel Energy Storage System; Hydraulic Energy Storage System; Comparison of different Energy Storage System.	talks and presentations	8
III	20.05.2022 2/3 Cells and Batteries- conversion of chemical energy to electrical energy- Battery Specifications: Variables to characterize battery operating conditions and Specifications to characterize battery nominal and maximum characteristics; Efficiency of batteries; Electrical parameters Heat generation- Battery design- Performance criteria for Electric vehicles batteries- Vehicle propulsion factors- Power and energy requirements of batteries- Meeting battery performance criteria- setting new targets for battery performance	talks and presentations	9
IV	Selection of battery for EVs & HEVs, Traction Battery Pack design, Requirement of Battery Monitoring, Battery State of Charge Estimation methods, Battery Cell equalization problem, thermal control, protection interface, SOC Estimation, Energy & Power estimation, Battery thermal management system, Battery Management System: Definition, Parts: Power Module, Battery, DC/DC Converter, load, communication channel, Battery Pack Safety, Battery Standards & Tests.	Chalk and talk/power point presentation,Videos/Learning material	9
V	Chemical & structure material properties for cell safety and battery design, battery testing, limitations for transport and storage of cells and batteries, Recycling, disposal and second use of batteries. Battery Leakage: gas generation in batteries, leakage path, leakage rates. Ruptures: Mechanical stress and pressure tolerance of cells, safety vents, Explosions: Causes of battery explosions, explosive process.	talks and presentations	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Develop a comparative case Study of different types of batteries with their characteristics & detailed specifications.	Experiments	BL2-Understand	2
II	Perform Vibration Test for traction batteries (Lead-Acid/Li-ion) as per AIS 048 standard.	Experiments	BL4-Analyze	2
II	Perform Shock Test for traction batteries (Lead-Acid/Li-ion) as per AIS 048 standard.	Experiments	BL5-Evaluate	2
III	SOC Estimation by Open Source voltage for Lead-Acid battery, Ni-MH battery and Liion battery	Experiments	BL4-Analyze	2
III	SOC Estimation by specific gravity for Lead-Acid battery.	Experiments	BL5-Evaluate	2
IV	Design a circuit for Battery monitoring System for Lead acid battery.	Experiments	BL4-Analyze	2
V	Series connection of batteries.	Experiments	BL5-Evaluate	2
V	Prallel connection of batteries	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1.Energy Resource Management, Krupal Singh Jogi (Sarup & Sons). 2. Non-Conventional Energy resources, Dr. B.H. Khan, Tata McGraw Hill. 3. Electrochemical Energy Storage: Physics and Chemistry of Batteries, De Gryuter, Reinhart Job. 4. Batteries: Materials Principles and Characterization Methods, Chen Liao, Chemical Sciences and Engineering Division, Argonne National Laboratory, Lemont, USA. 5. Batteries, Fuel Cells, and related Electrochemistry, U.S. Department of Energy, Washington, D.C. 2058
Articles	
References Books	1..Encyclopaedia of Automotive Engineering edited by David Crolla et al, Wiley, 2014 2. Design and Control of Automotive Propulsion Systems by Zongxuan Sun and Guoming Zhu, CRC Press, 2015 3. The Automotive Transmission Book by Robert Fischer, Ferit Küçükay, Gunter Jürgens, Rolf Najork, and Burkhard Pollak, Springer, 2015 4. Noise and Vibration Control in Automotive Bodies by Jian Pang, Wiley.
MOOC Courses	1.https://nptel.ac.in/courses/108106170 2.https://onlinecourses.nptel.ac.in/noc22_ee53/preview
Videos	1.https://www.youtube.com/watch?v=mNOYS-duUJY 2.https://www.youtube.com/watch?v=nrxmQhbZUTc&t=100s

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	1	-	-	1	1	-	-	-	1	-	1	-
CO2	-	1	-	-	1	-	-	-	1	1	-	-	-	-	-
CO3	2	-	1	-	-	1	-	-	-	-	-	-	-	-	1
CO4	-	-	-	2	-	-	1	-	2	-	-	-	1	-	-
CO5	-	-	-	-	1	-	-	2	-	-	2	-	-	-	-
CO6	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Digital Electronics and Logic Design
Course Code	EEL0340

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					3	1	1	5
Course Type	Embedded theory and lab							
Course Category	Disciplinary Minor							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** to introduces number systems and code systems. **(BL2-Understand)** **CO2-** To explains about Boolean operations and different logic gates**(BL2-Understand)** **CO3-** to understand and explains about the concept of data processing circuits like encoder, decoder, multiplexer and demultiplexer**(BL3-Apply)** **CO4-** to understand about the types of latches and flip-flops**(BL2-Understand)** **CO5-** to design different electronics circuits**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	Binary systems and logic gates: Digital Computer and Digital Systems, Number Systems & its conversions, Addition & Subtraction of numbers, Complements, Subtraction using compliments, Binary codes, Binary Storage and Registers, Binary Logic, Integrated Circuits. Boolean Algebra – Definitions, Theorems, Properties & Function, Canonical and Standard forms, Digital logic gates , IC Digital Logic Families.	Talks and presentations	10
2	Simplification of boolean funcions: The map method, Two and three Variable Maps, Four Variable Maps, Five- and Six- Variable Maps, Product of sums simplification, NAND and NOR Implementation, Two level implementation, Don,t–Care Conditions, Tabulation Method, Determination of prime- Implicants, Selection of prime- Implicants.	Talks and presentations	9
3	Combinational logic: Introduction, Design Procedure, Adders, Subtractor, Parity Generator, Code conversion, Analysis procedure, Multilevel NAND Circuits, Multilevel NOR Circuits, Exclusive-OR and Equivalence functions, Magnitude Comparator, Encoder, Decoder, Multiplexers, Demultiplexer, PLA & ROM.	Talks and presentations	8
4	Sequential logic: Introduction, Flip-FLOPS: SR, D, T, JK. Triggering of Flip-FLOPS, Analysis of clocked sequential Circuits, State Reduction and Assignment, Flip-FLOP excitation tables, Conversion between the flip –flops, Design Procedure, Design with state equations.	Talks and presentations	9
5	Registers, counters & memory unit: Registers, Registers with Parallel loading.Shift Registers: SISO, SIPO, PISO, PIPO, Bi-directional and unidirectional shift registers. Applications of Shift Registers. Counters: Ripple counters, Synchronous counters, Mode N Counters, Ring and Johnson counters. Timing Sequences. Memory Unit, Cache. Random Access Memories: SRAM & DRAM.	Talks and presentations	9

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1. Mano, M.M., Digital Design, Prentice Hall
Articles	
References Books	Reference Book: 1. Fletcher, W.I., Engineering Approach to Digital Design, Prentice Hall of India 2. Millman and Taub : Pulse, Digital and Switching Waveforms, MGH 3. W.H. Gothman : Digital Electronics, PHI. 4. Leach and Malvino : Digital Principles and Applications, TMH
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	1	1	-	-	-	-	1	1	2	2	2
CO2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	3
CO3	1	1	1	1	1	1	-	-	-	-	1	1	2	3	2
CO4	1	1	1	1	1	1	-	-	-	-	1	1	3	2	3
CO5	1	1	1	1	1	1	-	-	-	-	1	-	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Electric and Hybrid Vehicles
Course Code	EEL0435

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					3	1	2	6
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basic understanding of EV			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Choose a suitable drive scheme for developing an electric hybrid vehicle depending on resources**(BL1-Remember)** **CO2-** Design and develop basic schemes of electric vehicles and hybrid electric vehicles**(BL2-Understand)** **CO3-** Choose proper energy storage systems for vehicle application**(BL3-Apply)** **CO4-** Identify various communication protocols and technologies used in vehicle networks**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
I	Introduction to Hybrid Electric Vehicles: History of Hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.	talks and presentation	9
II	Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.	talks and presentation	8
III	Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives	talks and presentation, PBL	9
IV	Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power ,electronics, selecting the energy storage technology	talks and presentation, PBL	8
V	Communications, supporting subsystems: In vehicle networks- CAN, Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies	talks and presentation	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
III	Vector control of PMSM and IM drives over complete drive cycle of EV	Experiments	BL5-Evaluate	2
III	Characterization of power, torque and efficiency for EV over drive cycle	Experiments	BL5-Evaluate	2
II	Power flow in EV power train during charging, V2G feeding, motoring and braking	Experiments	BL4-Analyze	2
IV	Forward & backward motoring and regenerative braking of EV consisting of multiple motor- drives	Experiments	BL3-Apply	2
V	Synchronized PWM techniques for high-power and high-speed IM drives	Experiments	BL2-Understand	2
V	Working with the CAN communication	Experiments	BL2-Understand	2
I	Experiments on Type-I onboard charger	Experiments	BL6-Create	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1.Tom Denton, “Automotive Electrical and Electronic Systems”, 5th Edition, Routledge 2.Tom Denton, “Automotive Electrical and Electronic Systems”, 5th Edition, Routledge 3.Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003
Articles	1.E. Karden, S. Ploumen, B. Fricke, T. Miller and K. Snyder, “Energy storage devices for future hybrid electric vehicles,” J. Power Sources, vol. 168, no. 1, pp. 2–11, 2007
References Books	1.Berker B., James W. J. & A. Emadi, “Switched Reluctance Motor Drives”, CRC Press
MOOC Courses	1.https://onlinecourses.nptel.ac.in/noc22_ee53/preview Electric Vehicles - Part 1 By Prof. Amit Jain | IIT Delhi 2.https://nptel.ac.in/courses/108106170 Institute Logo NOC:Fundamentals of Electric vehicles: Technology & Economics, IIT Madras Prof. Ashok Jhunjhunwala Prof. Prabhjot Kaur Prof. Kaushal Kumar Jha Prof. L Kannan
Videos	1.Berker B., James W. J. & A. Emadi, “Switched Reluctance Motor Drives”, CRC Press 2.Berker B., James W. J. & A. Emadi, “Switched Reluctance Motor Drives”, CRC Press 3.https://www.youtube.com/watch?v=CWulQ1ZSE3c

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	-	2	-	1	-	1	1	1	-	1	-	-
CO2	-	-	1	1	-	1	-	-	2	-	-	-	-	-	1
CO3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	1	-	-	-	1	-	-	-	1	-	1	-
CO5	-	-	-	-	-	1	-	-	-	1	-	1	-	-	-
CO6	-	-	2	-	-	-	-	1	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Microprocessors & Interfacing
Course Code	EEL0509

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	1	1	5
Course Type	Embedded theory and lab							
Course Category	Interdisciplinary Major							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** to understand the 8085 PROCESSOR and its architecture**(BL2-Understand)** **CO2-** to understand the 8086 MICROPROCESSOR and its ARCHITECTURE **(BL2-Understand)** **CO3-** to understand the INSTRUCTION SET OF 8086**(BL2-Understand)** **CO4-** to understand INTERFACING DEVICEs**(BL2-Understand)** **CO5-** to understand different INTERFACING AND APPLICATION OF 8085 MICROPROCESSOR **(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
1	THE 8085 PROCESSOR : Introduction to microprocessors, Overview, History of microprocessor. 8085 microprocessor: Architecture, instruction set, interrupts structure, and Assembly language programming. Timing Diagrams & simple examples, including loops & nested loops	Talks and presentations	12
2	THE 8086 MICROPROCESSOR ARCHITECTURE : Architecture, block diagram of 8086, details of sub-blocks such as EU, BIU; memory segmentation and physical address computations, program relocation, addressing modes, instruction formats, pin diagram and description of various signals	Talks and presentations	13
3	INSTRUCTION SET OF 8086 : Instruction execution timing, assembler instruction format, data transfer instructions, arithmetic instructions, branch instructions, looping instructions, NOP and HLT instructions, flag manipulation instructions, logical instructions, shift and rotate instructions, directives and operators, programming examples.	Talks and presentations	11
4	INTERFACING DEVICE : 8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller	Talks and presentations	12
5	INTERFACING AND APPLICATION OF 8085 MICROPROCESSOR : Interfacing issues, Interfacing ADC &DAC, Interfacing memory, Microprocessor-based voltage, current, frequency, power measurement schemes.	Talks and presentations	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1. Microprocessor Architecture, Programming & Applications with 8085 : Ramesh S Gaonkar; Wiley Eastern Ltd. 2. The Intel Microprocessors 8086- Pentium processor : Brey; PHI
Articles	
References Books	REFERENCE BOOKS: 1. Microprocessors and interfacing : Hall; TMH 2. The 8088 & 8086 Microprocessors-Programming, interfacing,Hardware & Applications :Triebel & Singh; PHI 3. Microcomputer systems: the 8086/8088 Family: architecture, Programming & Design : Yu-Chang Liu & Glenn A Gibson; PHI. 4. Advanced Microprocessors and Interfacing : Badri Ram; TMH
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	1	1	-	-	-	-	1	1	2	2	2
CO2	1	1	1	1	1	-	-	-	-	-	1	1	2	2	3
CO3	1	1	1	1	1	1	-	-	-	-	1	1	2	3	2
CO4	1	1	1	1	1	1	-	-	-	-	1	1	3	2	3
CO5	1	1	1	1	1	1	-	-	-	-	1	-	3	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Electric Vehicles Control
Course Code	EEL0536

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					3	1	1	5
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basics of vehicle mechanism			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To study about the motor & device characteristics & parameters.**(BL1-Remember)** **CO2-** To know the various electric drive concepts**(BL2-Understand)** **CO3-** To have a knowledge of DC drive mechanism.**(BL3-Apply)** **CO4-** To have a knowledge of AC drive mechanism.**(BL4-Analyze)** **CO5-** To understand about drives for special electrical machines**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG8(Decent work and economic growth) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
I	Review of motor principles, motor load dynamics, starting, braking & speed control of dc and ac motors- power semiconductor SCRs, IGBTs and MOSFETs	talks and presentations	8
II	Basic drive, choice of electric drives, advantages, nature and classification of drives, control and stability of electric drives, feedback control of drives, thermal effects in electrical machines, selection of motor and rating.	talks and presentations	8
III	Transient analysis of separately excited dc motors, converter - single phase uncontrolled, half and fully controlled rectifiers, chopper control, closed loop control of solid-state DC drives	talks and presentations	8
IV	Operation of induction and induction motor, direct torque and flux control of induction motor drives, starting methods and speed control of single-phase induction motors, self-controlled synchronous motor drive, selection of motor and rating vector control of synchronous motor.	talks and presentations	8
V	Drives for variable reluctance motors, microprocessor/ microcontroller –gate trigger signal generation applications to special electrical machines, switched reluctance motor drives, brushless DC motor drives, permanent magnet drives.	talks and presentations	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
I	Study of Device Characteristics, linear and switching operations : SCR, Triac, BJT, Mosfet and IGBT. Study of Protection circuits	Experiments	BL2-Understand	2
II	Study of any one Embedded platform (Atmel, STM32, Microchip, TI) for Basic Embedded operations (I/O processing, interrupt processing.	Experiments	BL3-Apply	2
III	MOSFET based Step up and step down converter for low voltage EV loops	Experiments	BL4-Analyze	2
III	Half and full bridge converter and role of control signals for DC moto	Experiments	BL4-Analyze	2
IV	Demonstrating both Current/Voltage loop control of DC motor	Experiments	BL5-Evaluate	2
V	Study of drive schemes and role of control signals for induction motor	Experiments	BL5-Evaluate	2
IV	Demonstrating Control of Induction motor	Experiments	BL4-Analyze	2
V	Demonstrating Control of BLDC /PMSM /SRM moto	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	1.Gopal K D, “Fundamentals of Electric Drives”, Narosa Publishing House Pvt. Ltd., 2011. 2. Pillai S K, “A first course on Electrical Drives”, Wiley Eastern Ltd, Bombay 2011.
Articles	
References Books	1.Ali Elamadi, “Handbook Automotive Power Electronics and Drives”, CRC publishers, 2012. 2. Bimal K Bose, “Modern Power Electronics and Drives”, Elsevier publishers, Butterworth Hinnemann, 2012. 3. Krishnan R, “Permanent Magnet synchronous and Brushless DC Motor Drives”, CRC Publishers, 2010. 4. Krishnan R, “Switched Reluctance Motor Drives: Modeling, Simulation, Analysis, Design and Applications”, CRC Publishers, 2012
MOOC Courses	1.https://onlinecourses.nptel.ac.in/noc22_ee53/preview 2.https://nptel.ac.in/courses/108106170 3. https://nptel.ac.in/courses/108106170 4. https://onlinecourses.nptel.ac.in/noc22_ee53 5. https://onlinecourses.nptel.ac.in/noc21_ee112
Videos	1.https://www.youtube.com/watch?v=nrxmQhbZUTc&t=100s 2.https://www.youtube.com/watch?v=6H5vtu5_SF4

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	1	-	1	-	1	-	-	1	-	-	-	-
CO2	-	2	-	-	1	-	1	-	1	-	-	1	-	1	-
CO3	-	1	2	-	-	-	-	-	-	1	-	-	2	-	-
CO4	-	-	-	2	-	2	-	2	-	-	-	2	-	-	-
CO5	2	-	1	-	2	-	1	-	2	-	1	-	-	-	1
CO6	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Energy Management & Audit
Course Code	EEM0716

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Describe the basics of energy management, energy demand management and energy auditing**(BL1-Remember)** **CO2-** Understand the need and significance of energy audit and management and understand the concept of measuring instruments for energy auditing, defining, and examining the various characteristics of instruments.**(BL2-Understand)** **CO3-** To understand efficient heat & electricity utilization, saving and recovery in different thermal and electrical system.**(BL3-Apply)** **CO4-** Analyze energy consumption patterns and trends within an organization or system, evaluating the economic and environmental impacts of different energy management practices.**(BL4-Analyze)** **CO5-** Assess and compare various renewable energy technologies and their potential integration into existing energy systems, making informed recommendations based on feasibility and sustainability criteria.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✓ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education) SDG7(Affordable and clean energy) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	General energy problem: Energy use patterns and scope for conservation, Energy Scenario: Commercial and Non-commercial energy resources, Primary & secondary energy resources, Load forecasting,. Energy needs of growing economy, Thermodynamics of Energy Conservation Energy Conservation Act-2001 and its features.	Talks and presentations	12
Unit-2	Energy audit: Auditing and Targeting, Types of energy audit, Energy monitoring, Energy accounting and analysis, Energy conservation policy, Energy Auditing instruments, , Energy management system, Use of Artificial intelligence based techniques in EMS, Functions of energy managers.	Talks and presentations	13
Unit-3	Energy efficient electric drives, Energy efficient motors, Energy Conservation in transportation system especially in electric vehicle, Energy recovery in thermal systems, waste heat recovery techniques, thermal insulation. Thermal energy audit in heating, ventilation and air conditioning qualities, Energy storage for power systems (Mechanical, Thermal, Electrical & Magnetic).	Talks and presentations	11
Unit-4	Power factor improvement in power system Energy conservation by improvement of load factor, Energy conservation in different industries, e.g. Iron and Steel industry, Aluminum industry, Cement industry, Paper and Textile industry, Electrical Energy Conservation in building, heating and lighting and domestic gadgets.	Talks and presentations	10
Unit-5	Demand side management Load management, Energy costs and two-part tariff, Restructuring of electric tariff from energy conservation consideration, Energy storage and Co-Generation, Payback period, Energy economics, Economic analysis depreciation method, time value of money, Evaluation method of projects, replacement analysis, inflation risk analysis.	Talks and presentations	14

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Power Generation, Operation & Control, A.J. Wood and B.F. Wolenberg, John Wiley & Sons Ltd. 2. Patterns of Energy Use in Developing Countries by Desai, Wiley Eastern Ltd.
Articles	
References Books	1. Electrical energy utilization and conservation -- S C Tripathi ,Tata McGraw Hills 2. Energy Conservation- Paul O Callagan- Pergamon Press
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	3	3	3	-	-	-	-	-	-	-
CO2	3	3	1	2	-	3	2	3	-	-	-	-	-	-	-
CO3	3	3	1	2	-	3	2	3	-	-	-	-	-	-	-
CO4	3	3	1	2	-	3	2	3	-	-	-	-	-	-	-
CO5	3	3	1	2	-	3	2	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Power quality and industrial application
Course Code	EEM0717

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Basic knowledge of power system and power electronics			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember various aspects of Power quality and industrial applications.**(BL1-Remember)** **CO2-** To understand Industrial utilization, Power quality and maintenance.**(BL2-Understand)** **CO3-** To implement Flow charts and practice set to understand the subject.**(BL3-Apply)** **CO4-** To analyze the different numeric problems for well understand subjects problems**(BL4-Analyze)** **CO5-** To evaluate and summarize the data using statistical & visualization tools.**(BL5-Evaluate)** **CO6-** To prepare the models based on of real world problems of power quality. **(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Industrial Utilization: Type of lighting scheme, Design of Lighting schemes, factory lighting, methods of lighting calculations, street lighting, flood lighting.	Talks and presentations	12
Unit-2	Design of Distribution Systems: Development of a distribution plan, primary distribution design, secondary distribution design, planning and design of town electrification scheme, design of industrial distribution systems.	Talks and presentations	12
Unit-3	Power Quality: Overview of Power quality, power quality & EMC standards, Overview of Reliability evaluation: Generation reliability, distribution reliability, Industrial Power Systems reliability.	Talks and presentations, field work	12
Unit-4	Maintenance: An overview , role of maintenance in failure , design of maintenance system, need for maintenance planning , benefits of maintenance planning . Predictive maintenance, non destructive testing and diagnostic instruments, Safety management: Safety principle and guidelines, computers in maintenance and maintenance budget.	Talks and presentations, PBL, Case studies	12
Unit-5	Introduction to ISO 9000 and TQM: History of Quality, Quality management, quality principles, total quality , total quality control, total quality management, ISO9000.	Talks and presentations	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100		40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	M.V. Deshpande Electrical Power System Design TMH, New Delhi
Articles	
References Books	1. J.B. Gupta Utilization of Electric Power & Electric Traction Katson Publishing House Murphy M. D., and Tumbuli F Power Electronic Control of AC Motors Pergamon Press, Oxford University Press Math H.J. Bollen Understanding Power Quality Problems IEEE Press, Standard Publishers & Distributor, Delhi
MOOC Courses	1.Power Quality Electrical Engineering Prof. Bhim Singh IIT Delhi 2.Power Quality Improvement Technique Electrical Engineering Prof. Avik Bhattacharya IIT Roorkee 3.Power Quality in Power Distribution Systems Electrical Engineering Dr. Mahesh Kumar IIT Madras
Videos	https://www.youtube.com/watch?v=q4VjsHq4LOk https://www.youtube.com/watch?v=x_H3kqJR_YE

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	-	1	-	-	-	-	1	-	-	-	-	-	-	1	-
CO3	-	-	2	1	-	-	-	-	1	-	-	1	-	-	-
CO4	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	1	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Advanced power system protection
Course Code	EEM0718

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the various types of relays, comparators and their realization using static circuits.**(BL1-Remember)** **CO2-** Understand the realization of over current, distance and differential relays using comparators.**(BL2-Understand)** **CO3-** Realize the various dynamic characteristics of digital relays for protection of transmission lines, transformers**(BL3-Apply)** **CO4-** Analyze different Protection schemes of bus bar and transmission lines.**(BL4-Analyze)** **CO5-** Identify the new developments in Digital Protection.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG4(Quality education) SDG7(Affordable and clean energy) SDG9(Industry Innovation and Infrastructure) SDG13(Climate action)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Protective Relays: Relaying review, characteristics and operating equations of relays.CT's and PT's differential relay, over-current relay, reverse power relay, distance relays, applications of relays.	Talks and presentations	12
Unit-2	STATIC RELAYS: Introduction, advantages and disadvantages, classification logic ckts, smoothing circuits, voltage regulator square wave generator, time delay ckts level detectors, summation device, sampling circuit, zero crossing detector, output devices. COMPARATORS: Replica Impedance, mixing transformers, general equation of phase and amplitude comparator, realization of ohm, impedance and off set impedance characteristics, duality principle, static amplitude comparators, coincidence circuit, Hall effect devices, Magneto receptivity, zener diode phase comparator multi input comparators.	Talks and presentations	13
Unit-3	Generator and transformer protection: Protective devices for system. Protective devices for stator, rotor, and prime mover of generator, percentage differential relays protection, three winding transformer protection, earth fault protection, generator Transformer unit protection	Talks and presentations	11
Unit-4	Bus bar and transmission line protection: Distance protective schemes, directional wave detection relay. Phase compensation carrier protection. High impedance differential scheme, supervisory and check relay, Some features of 500 KV relaying protection.	Talks and presentations	10
Unit-5	Modern trends in power system protection: Different types of digital and computer aided relays, Microprocessor based relays, auto-reclosing, frequency relays, under and over frequency relays, di/dt relays. Algorithms for transmission line, transformer & bus bar protection; out-of-step relaying Introduction to adaptive relaying & wide area measurements	Talks and presentations	14

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Power System Protection and Switchgear, B.Ram – Tata Mc-Graw Hill Pub. 2. Switchgear and Protection, M.V.Deshpande - Tata Mc-Graw Hill Pub.
Articles	
References Books	1. Power System Protection & Switchgear, Ravindra Nath, M.Chander, Willy P 2.Computer Relaying for power system, Arun Phadke, James Thorp, Johns W P
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	3	-	2	-	-	-	-	-	-	-	-	-	2	3	-
CO3	3	-	3	-	-	-	-	-	-	-	-	-	3	2	-
CO4	2	-	2	-	-	-	-	-	-	-	-	-	3	3	-
CO5	2	-	3	-	-	-	-	-	-	-	-	-	3	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Distributed Generation System
Course Code	EEM0819

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Acquire the knowledge of evolution of smart grid, need of smart grid. Awareness about the national and the international policies undertaken in order to adopt smart grid concept worldwide.**(BL1-Remember)** **CO2-** Comprehend the acquaintance of intelligent electronic devices and their application in monitoring and protection. Understanding advantages and challenges of latest smart storage devices like SMES, pumped hydro storage and compressed air energy storage. Use of PMU and WAMS in modern power system analysis.**(BL2-Understand)** **CO3-** Understand the concept of real time pricing, automatic meter reading, outage management system. Identification of challenges and opportunities in advanced metering infrastructure and cyber security in smart grid.**(BL3-Apply)** **CO4-** Identification of power quality issues in grid connected renewable energy sources. Acquiring the knowledge of power quality conditioners and importance of power quality audit.**(BL4-Analyze)** **CO5-** Comprehend the acquaintance of micro grid and applications of micro grid. Understanding of thin solar films, variable speed wind generator, fuel cell and micro turbines in smart grid.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	DISTRIBUTED GENERATION: Energy Sources and their availability -trends in energy consumption, conventional and non-conventional energy sources – review of solar photovoltaic – wind energy systems – fuel cells, energy storage systems: batteries – ultra capacitors – fly wheels – captive power plants. Distributed generation – concept and topologies, renewable energy in distributed generation. IEEE 1547 Standard for interconnecting distributed generation to electric power systems – DG installations – siting and sizing of DGs – optimal placement – regulatory issues	Talks and presentations	12
Unit-2	ISSUES IN GRID INTEGRATION OF DISTRIBUTED ENERGY RESOURCES: Basic requirements of grid interconnections – operational parameters – voltage, frequency and THD limits – grid interfaces – inverter based DGs and rotary machines based DGs – reliability, stability and power quality issues on grid integration – impact of DGs on protective relaying and islanding issues in existing distribution grid.	Talks and presentations	13
Unit-3	MICROGRIDS: Introduction to microgrids – types – structure and configuration of microgrids – AC and DC micro-grids – power electronic interfaces for microgrids – energy management and protection control strategies of a micro-grid - case studies.	Talks and presentations	11
Unit-4	CONTROL OF MICROGRID: Modes of operation and control of microgrid: grid connected and islanded mode, active and reactive power control, protection issues, anti-islanding schemes: passive, active and communication based techniques	Talks and presentations	10
Unit-5	OPERATION OF MICROGRID- Microgrid communication infrastructure, power quality issues in microgrids, regulatory standards, microgrid economics, and introduction to smart microgrids.	Talks and presentations	14

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Essentials of Distributed Generation Systems,Gregory W. Massey, Jones & Bartlett Publishers. 2. Integration of Distributed Generation in the Power System Math H. Bollen, John Wiley & Sons
Articles	
References Books	3. Distributed Generation,N. Jenkins, Nicholas Jenkins, IET Press Rich E and Knight K, “Artificial Intelligence”, TMH, New Delhi. 4. Microgrids and Active Distribution Networks,S. Chowdhury, P. Crossley, IET Press. 5. Design of Smart Power Grid Renewable Energy Systems,Ali Keyhani, John Wiley & Sons
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	-	-	-	1	-	-	-	2	3	-
CO2	3	-	2	2	1	-	2	-	1	-	-	-	1	-	2
CO3	1	2	1	2	2	1	-	1	-	-	-	-	3	1	-
CO4	2	2	2	1	-	-	1	-	-	1	-	-	1	2	1
CO5	2	1	1	1	3	-	2	-	2	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	industrial instrumentation
Course Code	EEM0821

Part A

					L	T	P	C
Year	4th	**Semester**	8th	**Credits**	3	1	0	4
Course Type	Theory only							
Course Category	Disciplinary Major							
Pre-Requisite/s	To understand the contents and successfully complete this course, a participant must have a basic knowledge of Pressure, Sound, Flow, Temperature, Level, Humidity, Torque, Viscosity and Vibration measurements.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Describes the purpose of instrumentation in Industrial processes. **(BL1-Remember)** **CO2-** Describes the working of RTD, Thermostats, and thermocouple.**(BL2-Understand)** **CO3-** Describes the Bourdon tube, diaphragms and Bell gauges for pressure measurement and to employ flapper-nozzle assembly for differential pressure measurement.**(BL3-Apply)** **CO4-** Describes the various flow and level measurement devices used for industrial purposes.**(BL4-Analyze)** **CO5-** Elucidate the construction and working of various industrial devices used to measure pressure, sound and flow**(BL5-Evaluate)** **CO6-** Illustrate measurement techniques for acceleration, vibration and density **(BL6-Create)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Review of different transducers, their characteristics, displacement, force, torque and speed measurement, measurement of different industrial processes, pressure measurement, flow measurement, temperature measurement.	Talks and presentations	12
Unit-2	Pressure measurement: Different type of manometers, diaphragm gauges, bellow and force balance type sensors, bourdern gauge, piezoelectric, capacitive and inductive pressure pickups, Vacuum pressure measurements: Mcleod gauge, pirani gauge, thermocouple gauge, knudsen gauge, ionization calibration procedures.	Talks and presentations	12
Unit-3	Flow measurement: Differential pressure flow meters, pitat tube, orifice, vanturi flow nozzle, hot wire flow meter, constant pressure drop, variable area meters (rotameter), turbine meters. Electromagnetic flow meters, ultrasonic flow meters, measurement of level, differiential pressure method, conductive and capacitive method, electrochemical method, use of radio scope for level measurement.	Talks and presentations, Cse study	12
Unit-4	Temperature measurements: Different types of temperature transducers, RTDS, industrial type RTD sensor, laboratory grade platinum temperature thermometer, thermo resistance thermometer, thermisters temperature detectors, digital quartz crystal thermometer	Talks and presentations, Problem-based learning	12
Unit-5	Displacement measurement: Linear variable displacement transducer, capacitive transducer. Force measurement: Hydraulic force meter, pneumatic force meter, electric force transducers, strain gauge load cell, inductor load cells.	Talks and presentations	12

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	B.C. Nakra & K.K. Instrumentation Measurement and Analysis by B.C. Nakra & K.K. Chaudhary (VII Edition). Chaudhary (VII Edition), Tata McGraw Hill Publishing Ltd., New Delhi. 1. Electrical Measurement and Measuring Instruments by A K sawhney (VII Edition), Dhanpat Rai & Co. Tata McGraw Hill Publishing Ltd., New Delhi.
Articles	
References Books	A K sawhney Electrical Measurement and Measuring Instruments by A K sawhney (VII Edition), Dhanpat Rai D. Patranabis Principle of Industrial Instrumentation by Patranabis TMH , New Delhi. J.B. Gupta A Course in Electronic & Electrical Measurements & Instrumentation Kataria Sons
MOOC Courses	1.INSTART - Instrumentation Course https://www.udemy.com/course/instart-ic-training-course-chapter-1-basics/?couponCode=24T3MT53024 2.Instrumentation, Prof. Ashis Kumar Dutta, IIT Kharagpur
Videos	1.https://www.youtube.com/watch?v=7if7MSqiepg 2.https://www.youtube.com/watch?v=BOJqnvvWauE 3.https://www.youtube.com/watch?v=h8BlWgE8bH0

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	-	-	-	1	-	1	1	2	2	2
CO2	1	1	1	1	1	-	-	-	-	1	1	1	2	3	2
CO3	1	1	1	-	1	-	1	-	-	-	1	-	2	2	3
CO4	1	1	1	1	1	-	-	1	-	-	1	1	2	2	3
CO5	1	1	1	1	1	-	-	-	-	-	1	1	2	3	2
CO6	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	EHV AC and DC Transmission
Course Code	EEM0822

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the concept and performance of EHV transmission line.**(BL1-Remember)** **CO2-** Acquire the knowledge about the properties of bundled conductors**(BL2-Understand)** **CO3-** Understand about the various conventional and advanced compensation devices.**(BL3-Apply)** **CO4-** Understand the concept of HVDC Transmission and about the various scheme of converter station, 12 – pulse converter, converter unit, converter operation, fitters, reactive power source, ground return and ground electrode.**(BL4-Analyze)** **CO5-** Understand the concept of how to control the HVDC link. Comparison between AC and DC transmissions Applications of HVDC transmission. Power modulation and power control of HVDC lines.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education) SDG7(Affordable and clean energy) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Constitution of EHV a.c. and d.c. links, Kind of d.c. links, Limitations and Advantages of a.c. and d.c. transmission, Principal application of a.c. and d.c. transmission, Trends in EHV a.c. and d.c.transmission, Power handling capacity. Converter analysis garetz circuit, Firing angle control, Overlapping.	Talks and presentations	12
Unit-2	FACTS devices, basic types of controller, series controller, static synchronous series compensator(SSSC), thyristor-controlled series capacitor(TCSC), thyristor controlled series reactor(TCSR), shunt controller (STATCOM), static VAR compensator(SVC), series-series controller, combined series-shunt controller, unified power flow controller(UPFC), thyristor controlled phase shifting transformer(TCPST).	Talks and presentations	13
Unit-3	Components of EHV d.c. system, converter circuits, rectifier and inverter valves, Reactive power requirements, harmonics generation, Adverse effects, Classification, Remedial measures to suppress, filters, Ground return. Converter faults & protection harmonics misoperation, Commutation failure, Multiterminal D.C. lines.	Talks and presentations	10
Unit-4	Control of EHV d.c. system desired features of control, control characteristics, Constant current control, Constant extinction angle control. Ignition Angle control. Parallel operation of HVAC & DC system. Problems & advantages.	Talks and presentations	11
Unit-5	Travelling waves on transmission systems, Their shape, Attenuation and distortion, effect of junction and termination on propagation of traveling waves. Over voltages in transmission system. Lightning, switching and temporary over voltages: Control of lighting and switching over voltages	Talks and presentations	14

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	S. Rao,- “EHV AC & DC Transmission” Khanna pub. 2. Kimbark,-" HVDC Transmission” john willy & sons pub. 3. Arrillaga,- “HVDC Transmission”2nd Edition ,IEE londan pub.
Articles	
References Books	4. Padiyar, -“HVDC Transmission” 1st Edition ,New age international pub. 5. T.K. Nagsarkar,M.S. Sukhiza, -“Power System Analysis”, Oxford University 6. Narain.G. Hingorani, l. Gyugyi-”Undustanding of FACTS concept and technology”, John Wiley & sons pub. 7.P.Kundur- “H.V.D.C. Transmission” McGraw Hill Pub.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1	1	1	-	2	-	-	1	2	-
CO2	2	3	1	2	-	1	-	-	1	-	2	-	3	2	2
CO3	2	3	3	2	1	1	1	1	-	3	-	-	2	1	3
CO4	3	1	2	1	-	-	-	-	3	-	-	-	1	1	1
CO5	3	1	3	3	1	1	1	1	-	2	-	-	2	2	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	HVDC
Course Code	EEM0823

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To understand Generation of High Voltage**(BL1-Remember)** **CO2-** To learn and understand High Voltage Measurement**(BL2-Understand)** **CO3-** To know Industrial application of High Voltage Engineering**(BL3-Apply)** **CO4-** Analyze the operational characteristics and performance of HVDC systems under various conditions, including fault scenarios, and propose solutions to mitigate potential issues.**(BL4-Analyze)** **CO5-** To Evaluate High Voltage Test & Specifications**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Generation of High Voltage: Different methods of Generation of A.C., D.C., and Impulse High Voltage, Circuits for double exponential Impulse and switching surge Generation fast Switching, Analysis of Impulse waveform and Generator efficiency.	Talks and presentations	12
Unit-2	High Voltage Measurement: Review of Measurement methods, Electrostatic Voltmeter Compensated Dividers at power frequency, Divider for Impulse waveform, Divider at power frequency. Divider compensation critical High Voltage and current measurement, Optical signal links.	Talks and presentations	13
Unit-3	Industrial application of High Voltage Engineering: Electrostatic precipitator, spraying of liquid and power coating, Mineral Separation, Electrostatic Precipitation and printing Electrostatic hazards, Electron Microscope, X-ray Generation, Pulse power application, High power Electron beams for melting, welding etc, Application in space vehicles, Medical applications. Insulation Engineering.	Talks and presentations	12
Unit-4	Concepts of Electric stress, Dielectric Electric strength, Electric breakdown in vacuum, Gases, Liquids, Solids and dielectrics, testing in Solids, Insulation system in bushing, Transformers, Cables, Capacitors and Circuit breakers. Techniques of Electrical non-destructive evaluation of Material breakdown tests and measurement.	Talks and presentations	11
Unit-5	High Voltage Test & Specifications: Over voltage tests, Impulse test and routines interference test, Partial Discharge test, Test methods, Test on H.V.D.C. Equipment. High Voltage Switchgears: HVDC breakers, Harmonic Capacitors Switches, EHV Disconnecting switches, Corona and Corona losses, Earthing and Shielding of EHV System	Talks and presentations	13

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	High voltage Engineering by Dr. M.P. Chourasia Khanna Publisher Delhi. 2. High voltage Engineering by E. Kuffel & W.S. Zaengl, J. Kuffel, Newnes , New Delhi.
Articles	
References Books	High voltage Engineering by M.S. Naidu, V. Kamraju Tata McGraw Hill, New Delhi. 4. High voltage Engineering by C.L. Wadhwa, New Age International Ltd. Publisher ,New Delhi. 5. An Introduction to High Voltage Engineering by Subir Ray, Prentice Hall of India Pvt. Ltd.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	1	1	-	3	3	-	-	2	-	1	2	2
CO2	3	2	1	2	-	2	1	3	2	2	-	-	1	3	2
CO3	3	1	3	-	1	2	-	1	2	-	2	-	1	2	3
CO4	2	2	1	3	-	2	1	-	-	1	-	-	1	-	3
CO5	1	1	1	3	3	-	-	3	2	-	-	-	1	3	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Smart Grid and Energy Management
Course Code	EEM0824

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					3	1	0	4
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the fundamental principles, methodologies, and practices in energy management.**(BL1-Remember)** **CO2-** Conduct comprehensive energy audits to identify energy-saving opportunities and strategies.**(BL2-Understand)** **CO3-** Evaluate and implement energy efficiency measures in residential, commercial, and industrial buildings.**(BL3-Apply)** **CO4-** Explore and analyze sustainable energy solutions and their impact on energy management practices.**(BL4-Analyze)** **CO5-** Develop and implement effective energy management systems tailored for different facilities.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✓ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education) SDG7(Affordable and clean energy) SDG8(Decent work and economic growth) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction to Smart Grid: Evolution of electric grid, Definitions, Need for smart grid, Smart grid drivers, Functions of smart grid, Opportunities and barriers of smart grid, Difference between conventional grid and smart grid, Concept of resilient and self-healing grid. Components and architecture, Inter-operability, Impacts of smart grid on system reliability, Present development and international policies in smart grid, Smart grid standards.	Talks and presentations	12
Unit-2	Information and Communication Technology in Smart Grid: Wired and wireless communication -radio mesh, ZIGBEE, 3G, 4G and 5G. Digital PLC, DSL, Wi-Max, LAN, NAN, HAN, Wi-Fi, Bluetooth, Bluetooth Low Energy (BLE), Li-Fi. Communication Protocols in Smart grid, Introduction to IEC 61850 standard and benefits, IEC Generic Object-Oriented Substation Event - GOOSE, Substation model.	Talks and presentations	13
Unit-3	Smart grid Technologies Part I: Introduction to smart meters, Electricity tariff, Real Time Pricing- Automatic Meter Reading (AMR) - System, Services and Functions, Components of AMR Systems, Advanced Metering Infrastructure (AMI). Plug in Hybrid Electric Vehicles (PHEV), Vehicle to Grid (V2G), Grid to Vehicle (G2V), Smart Sensors, Smart energy efficient end use devices, Home & Building Automation. Intelligent Electronic Devices (IED) and their application for monitoring & protection: Digital Fault Recorder (DFR), Digital Protective Relay (DPR), Circuit Breaker Monitor (CBM), Phasor Measurement Unit (PMU), Standards for PMU. Time synchronization techniques, Wide Area Monitoring System (WAMS), control and protection systems (Architecture, components of WAMS, and applications: Voltage stability assessment, frequency stability assessment, power oscillation assessment, communication needs of WAMS, remedial action scheme).	Talks and presentations	11
Unit-4	Smart grid Technologies Part II: Smart substations, Substation automation, Feeder automation, Fault detection, Isolation, and Service Restoration (FDISR), Geographic Information System (GIS), Outage Management System (OMS). Introduction to Smart distributed energy resources and their grid integration, Smart inverters, Concepts of microgrid, Need and application of microgrid – Energy Management- Role of technology in demand response- Demand side management, Demand side Ancillary Services, Dynamic line rating.	Talks and presentations	10
Unit-5	Cloud computing in smart grid: Private, Public and hybrid cloud. Types of cloud computing services- Software as a Service (SaaS), Platform as a service (PaaS), Infrastructure as a service (IaaS), Data as a service (DaaS), Cloud architecture for smart grid. Cyber Security - Cyber security challenges and solutions in smart grid, Cyber security risk assessment, Security index computation. Power Quality Management in Smart Grid- Fundamentals, Power Quality (PQ) & Electromagnetic Compatibility (EMC) in smart grid, Power quality conditioners for smart grid. Case study of smart grid.	Talks and presentations	14

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Stuart Borlase “Smart Grid Infrastructure Technology and Solutions”, CRC Press; 2nd edition. 2. James Momoh, “Smart Grid: Fundamentals of Design and Analysis”, Wiley, 2012. 3. S. Chowdhury, “Microgrids and Active Distribution Networks.” Institution of Engineering and Technology, 2009.
Articles	
References Books	4. Janaka Ekanayake, Kythira Liyanage, Jianzhong Wu, Akihiko Yokohama, Nick Jenkins- “Smart Grids Technology and Applications”, Wiley, 2012. 5. Clark W.Gellings, “The Smart Grid: Enabling Energy Efficiency and Demand Response”, CRC Press. 6. Jean Claude Sabonnadière, Nouredine Hadjsaïd, “Smart Grids”, Wiley Blackwell.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	3	1	1	-	1	3	-	1	-	-	1	-	1
CO2	3	1	2	2	-	1	1	-	-	1	-	-	1	1	1
CO3	2	1	3	2	1	1	2	1	1	-	-	-	-	1	1
CO4	2	1	2	1	-	1	3	-	1	1	-	-	1	1	1
CO5	1	1	1	2	1	-	1	1	-	-	-	-	1	-	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Fundamentals of IoT and Sensors
Course Code	EEO0702

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic definitions, key terminologies of Sensors, Smart Sensors, & IoT. **(BL1-Remember)** **CO2-** To understand the working principles, concepts, & circuit designs of various sensors.**(BL2-Understand)** **CO3-** To apply that how to make Sensors by using different electronic components, apply an integrated knowledge on the Sensors, work with and interpret the data obtained from various sensor applications**(BL3-Apply)** **CO4-** To analyse various parameters of sensors using simulation or performing experiments on kits.**(BL4-Analyze)** **CO5-** Evaluate performance of sensors & actuators for various applications.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
1	Introduction to Sensors: Sensors, Transducers, Difference between Sensor & Transducer, Different criteria to choose a sensor. Classification of Sensors: analog sensors, digital sensors, scalar sensors, vectored sensors. Need of Sensors. Temperature Sensors: Thermocouple- measuring principle and its applications, Resistive temperature detectors (RTD): used materials and construction and its applications. Thermistors: Principle and application. Comparison among Thermistor, Thermocouple, & RTD.	Audio, Video clip/Group discussion/Research/Field visit	12
2	Different types of Sensors: PIR sensor, Ultrasonic sensor, Gas Sensors, Proximity Sensor, Rain sensor, Touch Sensor, IR Sensor, Humidity Sensor, Semiconductor Sensors: working principle and its applications. Optical Sensors: Photodiodes, Photoresistor, PIN diode, Position Sensitive photo detectors, Pressure sensors. Chemical sensors: Electrochemical sensor, Amperometric and voltammetric sensors, potentiometric sensor, Bio sensors and applications	LectureAudio, Video clip/Group discussion/Research/Field visit	12
3	Smart Sensors and Actuators: Architecture of sensor node, Components of Sensor, Participatory Sensing, Wireless sensor motes and its applications: Mica2/MicaZ Motes, TelosB Motes, XM1000 wireless mote, Indriya, IRIS, iSense, Preon32, Wasp Mote, WiSense Mote, panStamp NRG Mote . Actuators: Principle, Types and Examples of Actuators, Sensor Data Communication Protocols.	Audio, Video clip/Group discussion/Research/Field visit	12
4	Internet of things (IoT): An Overview: Basics, definition and vision of IOT, IoT Conceptual Framework, IoT Architectural View, Physical Design of IoT, Logical Design of IoT, Applications of IoT. RFID: features, working principle, and applications.	Audio, Video clip/Group discussion/Research/Field visit	10
5	IoT Practical Applications: Definition & Essentials of IoT & IoT applications for: Home, Cities, Environment, Energy Systems, Retail, Logistics, Industry, Agriculture, Health & Lifestyle.	Audio, Video clip/Group discussion/Research/Field visit	10

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
4	IOT based Smart specs	PBL	BL6-Create	30
2	smart dustbin based on iot	PBL	BL6-Create	30
1	To familiarize with various sensors such as LM 35 Temperature Sensor, PIR Sensor, Soil Sensor, Thermistor Sensor.	Experiments	BL6-Create	2
1	To study characteristics of Platinum RTD (Resistance Temperature Detector) sensor	Experiments	BL6-Create	2
1	To study Characteristics of NTC Thermistor sensor.	Experiments	BL5-Evaluate	2
1	Study the Characteristics of K Type Thermocouple.	Experiments	BL6-Create	2
1	Study the characteristics of Pressure Transducer/ Sensor.	Experiments	BL6-Create	2
2	To make a touch sensor using 555 Timer IC on Breadboard	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	30

Part E

Books	1) Arshdeep Bahga and Vijay Madisetti Internet of Things – A Hand-on Approach Universities press, 2015 2) Shantanu Bhattacharya, A K Agarwal, Environmental, Chemical and Medical Sensors, Springer Nature Singapore Pvt. Ltd. 2018
Articles	10.1088/978-0-7503-2707-7ch1
References Books	1) Donald Norris, The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black, McGraw Hill Publication Raj Kamal, Internet of Things, TMH, New Delhi.
MOOC Courses	https://courses.mooc.fi/org/uh-cs/courses/introduction-to-the-internet-of-things-mooc
Videos	http://www.iot-a.eu/public NPTEL Lectures for Introduction to IoT

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	1	1	2	2	1	2	3	1	-	3	3	3
CO3	-	1	3	2	1	2	2	2	-	1	-	3	3	3	2
CO4	1	2	2	3	2	-	-	2	-	-	2	1	3	2	2
CO5	-	-	-	-	1	2	-	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Soft computing Techniques
Course Code	EEO0703

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					3	0	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Learn about soft computing techniques and their applications**(BL1-Remember)** **CO2-** Analyze various neural network architectures**(BL2-Understand)** **CO3-** Define the fuzzy systems **(BL3-Apply)** **CO4-** Analyze the genetic algorithms and their applications. **(BL4-Analyze)** **CO5-** Evaluate and integrate various soft computing techniques in order to solve problems effectively and efficiently.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.	Talks and presentations	12
Unit-2	Neural Network: Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference between ANN and human brain, characteristics and applications of ANN, single layer network, Perceptron training algorithm, Linear separability, Widrow & Hebb;s learning rule/Delta rule, ADALINE, MADALINE, AI v/s ANN. Introduction of MLP, different activation functions. Radial basis function network, Kohonen self organizing feature map.	Talks and presentations	13
Unit-3	Fuzzy Logic: Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, fuzziness and probability theory. Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions, Fuzzy rule base system: fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.	Talks and presentations	11
Unit-4	Genetic algorithm: Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.	Talks and presentations	10
Unit-5	Various types of hybrid systems, Introduction to Particle Swarm Optimization and Ant Colony Optimization.	Talks and presentations	14

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	60	18	40	22
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. S, Rajasekaran & G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications”, Prentice Hall of India Publication. 2. N.P.Padhy, “Artificial Intelligence and Intellegent Systems” Oxford University Press.
Articles	
References Books	1. S.N. Sivanandam & S.N. Deepa, “Principles of Soft Computing”, Wiley Publications 2. Rich E and Knight K, “Artificial Intelligence”, TMH, New Delhi. 3. Bose, “Neural Network fundamental with Graph” , Algo.& Appl, TMH 4. Kosko, “Neural Network & Fuzzy System”, PHI Publication
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	-	1	-	2	-	-	-	3	3	-
CO2	3	1	-	2	-	-	-	-	-	1	-	-	3	3	3
CO3	1	3	3	2	1	-	-	1	1	-	-	-	2	-	2
CO4	2	-	-	2	-	-	1	1	-	-	-	-	2	3	2
CO5	2	1	2	-	3	-	-	-	2	-	-	-	3	2	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Electrical workshop practice
Course Code	EEP0101

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level								
Coures Elements	Skill Development ✕ Entrepreneurship ✓ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
1	Study and performance of different types of WIRE JOINTS	Experiments	BL3-Apply	2
2	Study and performance of GODOWN WIRING	Experiments	BL3-Apply	2
3	Study and performance of STAIRCASE WIRING	Experiments	BL3-Apply	2
4	Series and Parallel connection of Bulbs and Power sockets by single switch and multi switches	Experiments	BL4-Analyze	2
5	Assembling and soldering of 9V DC electronic DISCO LIGHT circuit with demonstration	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	60	30	40	20

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	-	1	-	-	1	-	-	-	1	-	-	-	-	-	1
CO3	-	-	21	-	-	-	-	-	-	2	-	2	-	-	-
CO4	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	1	-	-	-	2	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-

Syllabus-2023-2024

BTech-ElectricalEngineering

Title of the Course	Engineering Mechanics
Course Code	MEL0101[T]

Part A

Year	1st	**Semester**	1st	**Credits**	L	T	P	C
					3	1	2	6
Course Type	Embedded theory and lab							
Course Category	Foundation core							
Pre-Requisite/s	Knowledge of basic sciences			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Remember the basics of sciences in effects of system of forces on rigid bodies in static and kinetic conditions**(BL1-Remember)** **CO2-** Understand the basics of sciences in effects of system of forces on rigid bodies in static and kinetic conditions.**(BL2-Understand)** **CO3-** Apply system of forces in the belts drive systems as power transmission devices, shafts and beams.**(BL3-Apply)** **CO4-** Analyze the beams and trusses with centre of mass and moment of inertia.**(BL4-Analyze)** **CO5-** Evaluate shear force and bending moment in designing of shafts and beams and trusses.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professsonal Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction of Engineering Mechanics Basic concepts of system of forces- Coplanar Concurrent Forces - Components in Space – Resultant Moment of Forces and its Application - Couples and Resultant of Force System - Equilibrium of System of Forces- Free body diagrams- Equations of Equilibrium of Coplanar Systems and Spatial Systems.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-2	Friction Types of friction, Limiting friction, Laws of Friction, static and Dynamic Friction. Motion of Bodies - Wedge, Ladder and Screw jack.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-3	Transmission of Power Belt Drivers - Open, Crossed and compound belt drives, length of belt, tensions- tight side and slack side, Power transmitted and condition for maximum power.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-4	Center of Gravity & Moment of Inertia: Centroids - Centroids of Composite figures - Centre of Gravity of Bodies - Area moment of Inertia: - polar Moment of Inertia - Transfer - Theorems - Moments of Inertia of Composite Figures, Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia..	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Shear Force & Bending Moment Diagrams & Trusses: Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple. Application of Equilibrium Concepts. Trusses- types, method of joints and method of moments.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	1. To verify the law of Triangle of forces and Lami's theorem.	Experiments	BL3-Apply	2
Experiment-2	2. To verify the law of parallelogram of forces.	Experiments	BL3-Apply	2
Experiment-3	3. To verify law of polygon of forces	Experiments	BL3-Apply	2
Experiment-4	4. To find the support reactions of a given truss and verify analytically.	Experiments	BL4-Analyze	2
Experiment-5	5. To determine support reaction and shear force at a given section of a simply supported beam and verify in analytically using parallel beam apparatus.	Experiments	BL4-Analyze	2
Experiment-6	6. To verify bending moment at a given section of a simply supported beam.	Experiments	BL4-Analyze	2
Experiment-7	7. To find coefficient of friction on horizontal and inclined planes.	Experiments	BL4-Analyze	2
Experiment-8	8. To determine centre of gravity of different shapes	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	12	60	28
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	20	60	30

Part E

Books	Engineering Mechanics by Dr. D.S. Kumar, S.K. Kataria & sons, latest edition. Engineering Mechanics by R. K. Rajput, S.Chand & Co. Engineering Mechanics: Statics & Dynamics by R.C. Hibbler
Articles	
References Books	• Engineering Mechanics- statics dynamics by Boresi & Schmidt, Thomson Books • Engineering Mechanics - Schaum's series - Mc.Grawhill Publications. • Engineering Mechanics by S. Timashenko, D.H. Young and J.V. Rao
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	1	-	-	1	1	1	1	1	1
CO2	3	3	1	1	-	1	3	-	1	1	1	2	1	1	1
CO3	3	3	3	2	2	2	1	2	1	-	1	2	1	1	1
CO4	3	3	2	3	2	2	1	-	1	1	2	2	2	2	2
CO5	3	3	3	3	2	2	2	2	2	3	3	3	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Object Oriented Programming Methodology (Python)
Course Code	CSP0401[P]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Discipline Core							
Pre-Requisite/s				**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember the basic programming concept**(BL1-Remember)** **CO2-** Understand the basics of Python like python origin downloading and installing and basic concept of python**(BL2-Understand)** **CO3-** Apply the various conditional and looping statement and functional programming.**(BL3-Apply)** **CO4-** Explain various objects numbers and sequence in python Analyze the concept of regular expression.**(BL4-Analyze)** **CO5-** Evaluate the concept of object-oriented programming for better utilization of language.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG1(No poverty) SDG2(Zero hunger) SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction to Python programming Introduction, origin of Python, Downloading, Installing and Running Python, Python Basics: Comment, Identifier, Indentations, Basic data types, conversions, operators, Build in functions. I/O Statements, Condition Statements & Loops: If, else, elif), conditional expressions, while, for, break continue	Lectures with whiteboard/PPT, Recorded video/interactive videos, programming labs	8
Unit 2	Data Structures in Python Lists: Introduction, Accessing list, Operations, Working with lists, Tuple: Introduction, Accessing tuples, Operations, Working with list, Dictionaries: Introduction, Accessing values in dictionaries, Working with dictionaries, Set: Introduction ,Accessing set, Operations, Working with sets	Lectures with whiteboard/PPT, Recorded video/interactive videos, programming labs	8
Unit 3	Functions, Modules, File Handling Functions: Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous function, Global and local variables, Recursion. Modules: Creating modules, Importing module, Packages, File Handling :Opening and closing files, Reading and writing files	Lectures with whiteboard/PPT, Recorded video/interactive videos, programming labs	8
Unit 4	Exceptional Handling, Regular Expressions Exception Handling: Exception, Exception Handling, Try and Except clause, User Defined Exceptions, Exception handling in files). Regular Expressions: Introduction/motivation, special symbols and characters for REs , Match function, Search function., Matching VS Searching., Modifiers, Patterns.	Lectures with whiteboard/PPT, Recorded video/interactive videos, programming labs	9
Unit -5	Object Oriented Programming in Python Introduction, OOPS Basics: Class and object, Constructors, Need of Encapsulations, Attributes, default attributes, static attributes, static methods, initializing objects, Pass by reference , self. Relational-ships: Introduction, Aggregation, Dependency. Inheritance: Need of Inheritance, Overriding, Super, Types of Inheritance. Abstract Class, methods.	Lectures with whiteboard/PPT, Recorded video/interactive videos, programming labs	9

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
unit 1-2	Practical Assignment	Experiments	BL2-Understand	7
1-5	Activity Based Learning	Experiments	BL3-Apply	10

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	100	60			
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	2	2	-	-	-	2	-	-	1	-	1
CO2	1	2	1	2	2	2	-	-	-	2	-	-	1	-	3
CO3	2	2	1	-	1	-	-	-	-	-	-	-	3	2	3
CO4	2	2	-	3	1	-	-	-	-	-	-	-	3	3	3
CO5	2	2	-	2	1	-	-	-	-	-	-	-	2	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Training Report
Course Code	MEC0701[P}

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s	subject knowledge of Mechanical Engineering			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand themselves in relation to their community and develop among themselves since of social and civic and responsibility. **(BL2-Understand)** **CO2-** Identify the needs and problem of the community and involve them in problem solving. **(BL2-Understand)** **CO3-** Utilize their knowledge in finding practical solution to individual and community problem. **(BL3-Apply)** **CO4-** Develop the confidence require for group living and sharing of responsibilities of acquire leader ship qualities and democratic attitudes. **(BL4-Analyze)** **CO5-** Develop the capacity to meet emergencies and natural disasters and practice national integration and social harmony**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Industrial training has its own importance in a career of a student who is pursuing a professional degree. It is considered as a part of college curriculum. The objective of an industrial training is to provide us an insight regarding internal working of companies. We understand that theoretical knowledge is not enough for a successful professional career. With an aim to go beyond academics, industrial visit provides students a practical perspective of the work place. Industrial trainings provide an opportunity to learn practically through interaction, working methods and employment practices.	Field work	BL4-Analyze	40 hrs
Module-II	It gives students an exposure to current work practices as opposed to possibly theoretical knowledge being taught at college. Industrial visits provide an excellent opportunity to interact with industries and know more about industrial environment. Industrial trainings are arranged by TAP cell with an objective of providing us an opportunity to explore different sectors like IT, Manufacturing services, finance and marketing. Industrial visit helps to combine theoretical knowledge with practical knowledge. Industrial realities are opened to the students through industrial visits/trainings.	Field work	BL5-Evaluate	40 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	0	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	1	-	-	-	-	-	-	-	2	2	2
CO2	1	-	2	-	2	-	-	-	-	-	-	-	1	2	1
CO3	1	2	-	2	1	-	-	-	-	-	-	-	2	2	1
CO4	1	1	-	2	-	-	-	-	1	-	-	-	2	2	1
CO5	-	-	-	-	1	-	-	-	-	1	-	-	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Evaluation of Industrial Training-1
Course Code	MED0301[P]

Part A

Year	2nd	**Semester**	3rd	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s	subject knowledge of first and second semester .			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand themselves in relation to their community and develop among themselves since of social and civic and responsibility. **(BL2-Understand)** **CO2-** Identify the needs and problem of the community and involve them in problem solving. **(BL2-Understand)** **CO3-** Utilize their knowledge in finding practical solution to individual and community problem. **(BL3-Apply)** **CO4-** Develop the confidence require for group living and sharing of responsibilities of acquire leader ship qualities and democratic attitudes. **(BL4-Analyze)** **CO5-** Develop the capacity to meet emergencies and natural disasters and practice national integration and social harmony**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG4(Quality education)				

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Industrial training has its own importance in a career of a student who is pursuing a professional degree. It is considered as a part of college curriculum. The objective of an industrial training is to provide us an insight regarding internal working of companies. We understand that theoretical knowledge is not enough for a successful professional career. With an aim to go beyond academics, industrial visit provides students a practical perspective of the work place. Industrial trainings provide an opportunity to learn practically through interaction, working methods and employment practices.	Field work	BL3-Apply	40 hrs
Module-II	It gives students an exposure to current work practices as opposed to possibly theoretical knowledge being taught at college. Industrial visits provide an excellent opportunity to interact with industries and know more about industrial environment. Industrial trainings are arranged by TAP cell with an objective of providing us an opportunity to explore different sectors like IT, Manufacturing services, finance and marketing. Industrial visit helps to combine theoretical knowledge with practical knowledge. Industrial realities are opened to the students through industrial visits/trainings.	Field work	BL4-Analyze	40 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	1	-	-	-	-	-	-	-	2-	2	2
CO2	1	-	2	-	2	-	-	-	-	-	-	-	1	2	1
CO3	1	2	-	2	1	-	-	-	-	-	-	-	2	2	1
CO4	-	1	-	2	-	-	-	-	01	-	-	-	2	2	1
CO5	-	-	-	-	1	-	-	-	-	01	-	-	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Evaluation of Industrial Training-2
Course Code	MED0502[P]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s	subject knowledge of Mechanical Engineering			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand themselves in relation to their community and develop among themselves since of social and civic and responsibility. **(BL2-Understand)** **CO2-** Identify the needs and problem of the community and involve them in problem solving. **(BL2-Understand)** **CO3-** Utilize their knowledge in finding practical solution to individual and community problem. **(BL3-Apply)** **CO4-** Develop the confidence require for group living and sharing of responsibilities of acquire leader ship qualities and democratic attitudes. **(BL4-Analyze)** **CO5-** Develop the capacity to meet emergencies and natural disasters and practice national integration and social harmony**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Industrial training has its own importance in a career of a student who is pursuing a professional degree. It is considered as a part of college curriculum. The objective of an industrial training is to provide us an insight regarding internal working of companies. We understand that theoretical knowledge is not enough for a successful professional career. With an aim to go beyond academics, industrial visit provides students a practical perspective of the work place. Industrial trainings provide an opportunity to learn practically through interaction, working methods and employment practices.	Field work	BL4-Analyze	40 hrs
Module-II	It gives students an exposure to current work practices as opposed to possibly theoretical knowledge being taught at college. Industrial visits provide an excellent opportunity to interact with industries and know more about industrial environment. Industrial trainings are arranged by TAP cell with an objective of providing us an opportunity to explore different sectors like IT, Manufacturing services, finance and marketing. Industrial visit helps to combine theoretical knowledge with practical knowledge. Industrial realities are opened to the students through industrial visits/trainings.	Field work	BL5-Evaluate	40 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	1	-	-	-	-	-	-	-	2	2	2
CO2	1	-	2	-	2	-	-	-	-	-	-	-	1	2	1
CO3	1	2	-	2	1	-	-	-	-	-	-	-	2	2	1
CO4	1	1	-	2	-	-	-	-	01	-	-	-	2	2	1
CO5	-	-	-	-	1	-	-	-	-	01	-	-	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Minor Project
Course Code	MED0603[P]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Project							
Course Category	Projects and Internship							
Pre-Requisite/s	Knowledge of Mechanical engineering and interdisciplinary subjects.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To enhance writing skills and knowledge.**(BL2-Understand)** **CO2-** To increase their mental ability.**(BL3-Apply)** **CO3-** To inculcate the ability to express innovative opinion and thoughts**(BL4-Analyze)** **CO4-** To have Dissertation works as skills development in students.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕	**SDG (Goals)**						

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Identification of a problem and formulation of a topic of project/thesis	PBL	BL3-Apply	15 hrs
Module-III	Dissertation and Viva-voci	PBL	BL5-Evaluate	20 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2-	2	-	1	-	-	-	-	-	-	-	2	2	2
CO2	1	-	2	-	2	-	-	-	-	-	-	-	1	2	1
CO3	1	2	-	2	1	-	-	-	-	-	-	-	2	2	1
CO4	-	1	-	2	-	-	-	-	01	-	-	-	2	2	1
CO5	-	-	-	-	1	-	-	-	-	01	-	-	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Major Project
Course Code	MED0702[P]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					0	0	2	2
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s	Knowledge of Mechanical engineering and interdisciplinary subjects.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To enhance writing skills and knowledge.**(BL2-Understand)** **CO2-** To increase their mental ability.**(BL3-Apply)** **CO3-** To inculcate the ability to express innovative opinion and thoughts.**(BL4-Analyze)** **CO4-** To have Dissertation works as skills development in students. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**					

Part B

Modules	Contents	Pedagogy	Hours
Module-I			

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Identification of a problem and formulation of a topic of project/thesis	PBL	BL3-Apply	48 hrs
Module-III	Dissertation and Viva-voci	PBL	BL5-Evaluate	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	50				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	1	-	-	-	-	-	-	-	2	2	2
CO2	1	-	2	-	2	-	-	-	-	-	-	-	1	2	1
CO3	1	2	-	2	1	-	-	-	-	-	-	-	2	2	1
CO4	1	1	-	2	-	-	-	-	1	-	-	-	2	2	1
CO5	-	-	-	-	1	-	-	-	-	1	-	-	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Major Project
Course Code	MED0803[P]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					0	0	8	8
Course Type	Lab only							
Course Category	Projects and Internship							
Pre-Requisite/s	Knowledge of Mechanical engineering and interdisciplinary subjects.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To enhance writing skills and knowledge.**(BL2-Understand)** **CO2-** To increase their mental ability.**(BL3-Apply)** **CO3-** To inculcate the ability to express innovative opinion and thoughts.**(BL4-Analyze)** **CO4-** To have Dissertation works as skills development in students.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✗ Gender ✗ Human Values ✗ Environment ✗	**SDG (Goals)**						

Part B

Modules	Contents	Pedagogy	Hours

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Module-I	Identification of a problem and formulation of a topic of project/thesis	PBL	BL3-Apply	15 hrs
Module-II	To have field work and data collection through a chosen methodology	PBL	BL4-Analyze	15 hrs
Module-III	Dissertation and Viva-voci	PBL	BL5-Evaluate	20 hrs

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	150				
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
300	0	120	60	180	

Part E

Books	
Articles	
References Books	
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	1	-	-	-	-	-	-	-	2	2	2
CO2	1	-	2	-	2	-	-	-	-	-	-	-	1	2	1
CO3	1	2	-	2	1	-	-	-	-	-	-	-	2	2	1
CO4	1	1	-	2	-	-	-	-	1	-	-	-	2	2	1
CO5	-	-	-	-	1	-	-	-	-	1	-	-	2	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Non-Conventional Energy resources
Course Code	MEE0705

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Basic knowledge of energy and souses of energy.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall the energy conversion systems.**(BL1-Remember)** **CO2-** To understanding the solar thermal plate.**(BL2-Understand)** **CO3-** To apply the concept related to non conventional energy.**(BL3-Apply)** **CO4-** To analyze the energy conversion in non-conventional energy conversion in various fields.**(BL4-Analyze)** **CO5-** To evaluate the performance and efficiency of energy aspects on the basis of different parameters.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG8(Decent work and economic growth)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	General Introduction Various non-conventional energy resources–Introduction availability classification relative merits and demerits. Solar Cells Theory of solar cells. Solar cell materials. Solar cell array. Solar cell power plant imitation.	Lectures with white board and PPT, Quiz,Reportwriting,Case Based Assignments	8
Unit-2	Solar Thermal Energy Solar radiation flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, application and performance. Solar thermal power plants. Thermal energy storage for solar heating and cooling limitations	Lectures with white board and PPT, Quiz,Reportwriting,Case Based Assignments	8
Unit-3	Geothermal Energy Resources of geothermal energy thermodynamics of geo-thermal energy conversion- electrical conversion non- electrical conversion environmental Magneto hydrodynamics (MHD) Principle of working of MHD power plant, Performance and limitations. Fuel Cells Principle of working of various types of fuel cells and their working, Performance and limitations.	Lectures with white board and PPT, Quiz,Reportwriting,Case Based Assignments	8
Unit-4	Thermo-electrical and thermionic conversions Principle of working, performance and limitations. Wind Energy; Wind power and its source, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitations of energy conversion systems.	Lectures with white board and PPT, Quiz,Reportwriting,Case Based Assignments	8
Unit-5	Bio mass Ocean thermal energy conversion (OTEC) Availability, theory and working principle performance and limitations Wave and Tidal wave principle of working, performance and limitations. Water recycling plant.	Lectures with white board and PPT, Quiz,Reportwriting,Case Based Assignments	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Raja etal, Introduction Non-Conventional energy resources" SciTech Publications. 2. Johan Twiden and Tony weir "Renewal energy resources "BSP Publications 2006. 3. D.S Chauhan " Non-Conventional energy resources" New Age International. 4. C.S Solanki" Renewal Energy Technology" A Practical Guide for Beginners" PHI.
Articles	
References Books	1. Ghosh and Mallick "Manufacturing Science" East West Press, 2010. 2. Jain R. K. "Production Technology" Khanna Publishers, 2001.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc22_ge14/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	2	2	3	-	3	3	-	1	3	-	3
CO2	3	-	2	2	1	2	2	-	3	3	2	-	3	3	3
CO3	2	-	2	1	3	-	3	1	2	1	-	2	3	3	3
CO4	1	2	2	3	2	2	2	1	-	-	1	2	3	-	3
CO5	1	2	1	3	2	-	2	-	-	-	-	1	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Industrial Robotics
Course Code	MEE0709

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Engineering mechanics, Machine design			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** 1. Comprehend, classify and analyze the fundamentals of robotics.**(BL1-Remember)** **CO2-** 2. Analyze the inverse manipulator kinematics and dynamics.**(BL2-Understand)** **CO3-** 3. Gain the knowledge about the manipulator design and mechanism.**(BL3-Apply)** **CO4-** 4. Elucidate the role of actuators, drive systems and sensors in robotics.**(BL4-Analyze)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit:1	Introduction: Fundamentals and robot - components, joints, degrees of freedom, coordinates. The mechanics & control of mechanical manipulators. Spatial Descriptions and Transformations: Descriptions – Positions, Orientations, and Frames, Mappings, Operators – Translations, Rotations, and Transformations, Transformation arithmetic and transform equations, transformation of free vectors, Representation & Orientation.		
Unit:2	Manipulator Kinematics: Links & Connections. Actuator Space, Joint Space and Cartesian Space. Tools & Computational considerations.		
Unit:3	Solvability, Algebraic and Geometric. Standard Frames, Repeatability and Accuracy. Jacobians: Velocities and Static Forces: Time varying position and orientation.		
Unit:4	Linear and rotational velocity of rigid bodies. Jacobians & Singularities. Cartesian transformation of velocities and static forces. Kinematic Configuration. Workspace measures and attributes. Redundant and closed chain structures. Actuation Schemes, Stiffness & Deflections. Position Sensing & Force Sensing.		
Unit:5	Mass Distribution. Newton's and Euler's Equations. Iterative and Closed Form. Lagrangian formulation of manipulator dynamics. Manipulator Dynamics in Cartesian Space. Non-rigid body effects. Basic components & terminology. System Dynamics. Laplace transform and inverse Laplace transform. First and second order transfer functions. Proportional and proportional plus controllers. State space control methodology. Digital control and non-linear control systems.		

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	John J. Craig, "Introduction to Robotics Mechanics and Control", Pearson Education Limited 2022 Saeed B. Niku, "Introduction to Robotics Analysis, Control, Applications", John Wiley & Sons Ltd 2020.
Articles	
References Books	Nicholas Odrey, Mitchell Weiss, Mikell Groover, Roger Nagel and Ashish Dutta. "Industrial Robotics-Technology, Programming and Applications", McGraw Hill Education; 2nd edition, 2017.
MOOC Courses	
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	2	2	-	2	3	1	-	3	3	3
CO3	1	2	3	2	1	-	2	2	2	1	-	3	3	3	2
CO4	1	3	3	3	2	-	2	2	-	-	2	2	3	2	2
CO5	-	2	2	2	2	3	3	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Finite Element Method
Course Code	MEE0816

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Knowledge of basic sciences and machine design			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the concepts behind formulation methods in FEM**(BL1-Remember)** **CO2-** Identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements. **(BL2-Understand)** **CO3-** Able to apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axi symmetric and dynamic problems and solve them displacements, stress and strains induced.**(BL3-Apply)** **CO4-** Analyse element characteristic equation and generation of global equation**(BL4-Analyze)** **CO5-** Develop element characteristic equation and generation of global equation. **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-I	Introduction-Different approaches in Finite Element Method - Direct Stiffness approach, simple examples, Variational approach, Elements of variational calculus - Euler Lagrange equation, Rayliegh Ritz method, Weighted Residual methods, Point Collocation method, Sub domain Collocation method, Galarkins method - Steps involved in FEM.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-II	Types of elements used Interpolation Polynomials - Linear elements Shape function - Analysis of simply supported beam - Element and Global matrices - Two-dimensional elements, triangular and rectangular elements - Local and Natural Co-ordinate systems.	Lectures with whiteboard/PPT, Quiz, Group discussion	
Unit-III	Finite element formulation of field problems Classification of partial differential equations - Quasiharmonic equation - Steady state problems - Eigen value problems - Propogation problems - Examples, Torsional problem - Fluid flow and Heat transfer problems - Acoustic vibrations.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-IV	Finite element formulation of solid mechanics problems Axial force member - element matrices for axial force members - Truss element analysis of pinned truss - Two dimensional elasticity problems	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-V	Numerical methods in fem Evaluation of shape functions - One dimensional & triangular elements, Quadrilateral elements, Isoperimetric elements - Numerical Integration, Gauss Legendre quadrature - Solution of finite element equations - Cholesky decomposition, Skyline storage - Computer implementation.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100		40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	1. Larry J Segerlind ,“ Applied Finite Element Analysis”, John Wiley, 1984. 2. Bathe K.J., “Finite Element Procedures”, Prentice Hall, 1994.
Articles	
References Books	3. Huebner and Thornton E.A., “The Finite Element Method for Engineers”, John
MOOC Courses	https://www.mooc-list.com/tags/finite-element-method
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	1	1	1	1	1	3	2	3	3	3
CO3	1	2	3	2	1	2	2	2	2	1	2	3	3	3	2
CO4	1	3	3	3	2	-	3	2	-	-	2	2	3	2	2
CO5	3	2	3	3	2	3	3	-	-	-	2	-	3	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Project Management
Course Code	MEE0818

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Knowledge of industrial engineering and operation research.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** 1. To recall the managerial concepts.**(BL1-Remember)** **CO2-** 2. To describe the project organization and cost estimation.**(BL2-Understand)** **CO3-** 3. To develop the blueprint of the project.**(BL3-Apply)** **CO4-** 4. To analyze the financial aspects of the project.**(BL4-Analyze)** **CO5-** 5. To evaluate the project planning and modification of the network models.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Project Management Concepts: Introduction, project characteristics, taxonomy of projects, project identification and formulation. Establishing the project and goals. Nature & context of project management; phases of PM, A framework for PM issues, PM as a conversion process, project environment & complexity. Organizing human resources, organizing systems and procedures for implementation. Project direction	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-2	Project Organization and Project Contracts: Introduction, functional organization, project organization, matrix organization, modified matrix organization, pure project organization, selection of project organization structure, project breakdown structures, project contracts, types of contracts, types of payments to contractors.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-3	Project Appraisal & Cost Estimation: Introduction, technical appraisal, commercial appraisal, economic appraisal, financial appraisal, management appraisal, social cost/benefit analysis, project risk analysis. Cost analysis of the project, components of capital cost of a project, modern approach to project performance analysis.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-4	Project Planning & Scheduling: Introduction to PERT & CPM, planning and scheduling networks, time estimation, determination of critical path, CPM model, event slacks & floats, PERT model, expected time for activities, expected length of critical path, calculating the project length and variance, PERT & CPM cost accounting systems, lowest cost schedule, crashing of networks, linear programming formulation of event oriented networks, updating of networks, LOB technique.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Modification & Extensions of Network Models: Complexity of project scheduling with limited resources, resource leveling of project schedules, resource allocation in project scheduling - heuristic solution. Precedence networking- examples with algorithm, decision networks, probabilistic networks, computer aided project management-essential requirements of PM software, software packages for CPM. Enterprise- wide PM, using spread sheets for financial projections.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	1. Shtub, Bard and Globerson, Project Management: Engineering, Technology, and Implementation, PH Inc. 2. Lock, Gower, Project Management Handbook. 3. Cleland and King, VNR Project Management Handbook. 4. Wiest and Levy, Management guide to PERT/CPM, PHI. 5. Horald Kerzner, Project Management: A Systemic Approach to Planning, Scheduling and Controlling, CBS Publishers, 2002. 6. S. Choudhury, Project Scheduling and Monitoring in Practice. 7. P. K. Joy, Total Project Management: The Indian Context, Macmillan India Ltd.
Articles	
References Books	1. John M Nicholas, Project Management for Business and Technology: Principles and Practice, Prentice Hall of India, 2002. 2. Smith N. J. (Ed), Project Management, Blackwell Publishing, 2002. 3. Robert K. Wysocki, Robert Back Jr. and David B. Crane, Effective Project Management, John Wiley, 2002. 4. Jack R Meredith and Samuel J Mantel, Project Management: A Managerial Approach, John Wiley, 4th Edition, 2000.
MOOC Courses	https://www.coursera.org/courses?query=project%20management
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	1	2	-	2	2	2	2	3	2	2	2	3
CO2	1	1	1	1	2	2	2	2	2	2	3	-	2	2	3
CO3	2	2	2	3	1	1	1	1	2	3	3	-	3	2	3
CO4	3	3	2	3	2	-	-	-	2	2	3	-	3	2	3
CO5	3	3	2	3	2	-	2	-	2	2	3	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Production and Operation Management
Course Code	MEE0819

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	knowledge of industrial engineering and operation research.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** 1. To recall the industrial engineering and management concepts.**(BL1-Remember)** **CO2-** 2. To describe the production planning and control.**(BL2-Understand)** **CO3-** 3. To develop the planning of resources and operations.**(BL3-Apply)** **CO4-** 4. To analyze the financial aspects of the material procurement and maintenance management.**(BL4-Analyze)** **CO5-** 5. To evaluate the Production planning and master scheduling.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-I	Operations Management: Introduction, systems concept, decisions, organization, objectives and evolution of operations management, comparing production of tangible goods and services, operations strategy, type of production systems, role of production manager.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-II	Facilities Planning & Production Planning Control: Plant location, plant layout and material handling, layout analysis, procedures such as CORELAP, CRAFT etc. Organization and functions of PPC CAPP, make or buy decision, forecasting methods and its relationship with product life cycle, case studies.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-III	Aggregate Planning and Master Scheduling: Strategies of aggregate planning, graphic and charting methods, application of LP, master scheduling, job shop scheduling and sequencing algorithms Gantt chart, line balancing, LOB, case studies.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-IV	Maintenance Management: Types of maintenance strategies, breakdown, preventive and predictive maintenance, individual and group replacement policies, case studies.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-V	Materials Management: As part of supply chain, purchasing, stores and vendor selection, inventory models, selective inventory control, MRP, MRP-II, lot size techniques, just - in – time system of manufacturing, Kaizen, Total Productive Maintenance (TPM), BPR, SCM, ERP etc. and case studies.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	Hop W, Spearman M; Factory Physics; TMH 2. Charry S.N.; Production & Operations Management; TMH. 3. Chase, Acquilino, Production & Operations Managment, TMH. 4. Eilon S. Production Planning and Control, McMillon Pub. 5. Vollmann; Mfg planning and control for SCM; TMH
Articles	
References Books	1.Nahmias Steven; Production and Operations analysis; TMH 2. Bedi Kaniska; Production and Operations Management; Oxford Pub 3. Dobler & Lee, Purchasing & Materials Management, PHI. 4. Chitle A.K., Gupta R.C. Materials Management, PHI. 5. Monk Joseph; Schaum's outline of Operations Management; McGraw Hill.
MOOC Courses	https://www.mooc-list.com/tags/operations-management
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	1	2	-	2	2	2	2	3	2	2	2	3
CO2	1	1	1	1	2	2	2	2	2	2	3	-	2	2	3
CO3	2	2	2	3	1	1	1	1	1	2	3	-	3	2	3
CO4	3	3	2	3	2	-	-	-	2	2	3	-	3	2	3
CO5	3	3	2	3	2	-	2	-	2	2	3	-	3	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Machine learning for Robotics
Course Code	MEE0820

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Electives							
Pre-Requisite/s	Knowledge of basic sciences and machine design.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** 1. To recall the theoretical foundations of various learning algorithms.**(BL1-Remember)** **CO2-** 2. To understand the context of supervised and unsupervised learning through real-life examples.**(BL2-Understand)** **CO3-** 3. Apply all learning algorithms over appropriate real-time dataset.**(BL3-Apply)** **CO4-** 4. Evaluate the algorithms based on corresponding metrics identified.**(BL4-Analyze)** **CO5-** 5. Analyze the requirements of Machine Learning applications in context-aware robotic environment.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction to Machine Learning Introduction – Exploration – Learning Paradigms – Role of Machine Learning in Robotic applications	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-2	Supervised Learning – I Linear and Non-Linear – Multi–Class & Multi-Label classification – Linear Regression – Multilinear Regression – Naïve Bayes Classifier – Decision Trees – ID3 – CART – Fine tuning of algorithms for robotic environment.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-3	Supervised Learning – II K-NN classifier – Logistic regression – Perceptrons – Single layer & Multi-layer – Support Vector Machines – Linear & Non-linear – Error Bounds Fine tuning of algorithms for robotic environment.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-4	Unsupervised Learning Real time Datasets – Pre-processing Clustering basics (Partitioned, Hierarchical and Density based) - K-Means clustering – K- Mode clustering – Principal Component Analysis – Kernel PCA - Error Bounds – Ensemble Learning (Random Forest, XGBoost) – Fine tuning of algorithms for robotic environment. Class Imbalance – SMOTE – One Class SVM – Optimization of hyperparameters.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Reinforcement Learning Robotics & Machine Learning Alliance Basics of RL – RL Framework – Markov Decision Process – Exploration Vs Exploitation Design constraints and considerations – setting up the environment – Applications and case studies in Robotics	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
	0				

Part E

Books	1 Ethem Alpaydin,"Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014. 2 Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press, 2012. 3 Reinforcement Learning: An Introduction (Adaptive Computation and Machine Learning series) 2nd edition, Richard S. Sutton and Andrew G. Barto, A Bradford Book; 2018, ISBN 978-0262039246
Articles	
References Books	1 Tom Mitchell, “Machine Learning”, McGraw Hill, 3rd Edition, 1997. 2 Charu C. Aggarwal, “Data Classification Algorithms and Applications”, CRC Press, 2014.
MOOC Courses	https://www.mooc-list.com/tags/robotics
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	1	1	1	1	-	1	1	1	1	1	1
CO2	3	3	1	1	2	2	1	3	1	1	1	2	2	2	2
CO3	3	3	3	2	2	2	-	-	1	2	1	2	1	1	2
CO4	3	2	3	2	3	3	-	1	1	2	3	2	2	2	3
CO5	3	3	3	2	-	-	-	3	2	2	2	1	2	2	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Additive Manufacturing
Course Code	MEL 0627[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Understanding of the concept of design knowledge of CAD. Understanding of the concept of material and manufacturingg.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall the fundamental principles of additive manufacturing.**(BL1-Remember)** **CO2-** To understand the fundamental principles of additive manufacturing.**(BL2-Understand)** **CO3-** To apply appropriate material selection criteria for different additive manufacturing applications.**(BL3-Apply)** **CO4-** To compare and contrast different additive manufacturing processes based on their strengths and weaknesses**(BL4-Analyze)** **CO5-** To evaluate strategies for integrating additive manufacturing into existing manufacturing systems for improved efficiency and productivity.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Introduction and Basic Principles Rapid prototyping and tooling, prototype fundamentals-types of prototypes, History of RP system, development of rapid prototyping, fundamentals of rapid prototyping, Tooling. Three Phases of Development, advantages of rapid prototyping, direct benefits, indirect benefits. Trends in manufacturing, Conventional Machining, Processes- Development of a CAD model, Generation of STL Files, Slicing the STL fileSupport Structures, Manufacturing, Post processing. Fundamentals, need, advantages, disadvantages, benefits, Complexity, Accuracy, Geometry Additive Manufacturing, AM Parts, uses, The Generic AM Process, Layer-Based Manufacturing, 3D Printing, Benefits of AM, Distinction Between AM and CNC Machining, Practical Example AM Parts	Lectures with white board/PPT, Quiz, Group discussion	8
Unit-2	Development of Additive Manufacturing Technology Introduction, Computers, Computer-Aided Design Technology, Other Associated Technologies, The Use of Layers, Classification of AM Processes, Metal Systems, Hybrid Systems, Milestones in AM Development,, AM Around the World, Rapid Prototyping ,Direct Digital Manufacturing	Lectures with white board/PPT, Quiz, Group discussion	8
Unit-3	Liquid-Based Systems 3D Systems Stereolithography Apparatus (SLA), Models and Specifications, Advantages and Disadvantages, Process, Principle, Photopolymers, Photopolymerization, Layering Technology, Solid Ground Curing (SGC), Introduction, Highlights Process Machine Details Applications.	Lectures with white board/PPT, Quiz, Group discussion	8
Unit-4	Solid-Based Rapid Prototyping Systems Fused Deposition Modelling. Modelling System Hardware, Software, Build Materials, The Extrusion Head, Drive Blocks, The Heating Chamber Tips Build Substrate Fused Deposition Modelling Operation Orientation/Positioning Slicing, Build Parameters Uses of Fused Deposition Modelling Parts Advantages and Disadvantages Key Terms Laminated Object Manufacturing, System Hardware, Laminated Object Manufacturing Operation, Software, Part Orientation Crosshatching System Parameters Laminated Object Manufacturing Build Technique, Finishing a Laminated Object Manufacturing Part, Uses of Laminated Object Manufacturing Advantages and Disadvantages Materials Properties	Lectures with white board/PPT, Quiz, Group discussion	8
Unit-5	Powder-Based Rapid Prototyping Systems Selective Laser Sintering, Selective Laser Sintering Technology, Purpose, Current State, Advantages, High Throughput Capability, Self- Supporting Build Envelope, Purpose, applications, advantages, Disadvantages, Powder Bed Fusion Processes, Materials Various other Techniques	Lectures with white board/PPT, Quiz, Group discussion	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment -1	Study of Rapid Prototyping and Tooling.	Experiments	BL4-Analyze	2
Experiment -2	Study of Layered Manufacturing (LM).	PBL	BL4-Analyze	2
Experiment -3	Study of Laminated Object Manufacturing (LOM).Laminated Object Manufacturing	Experiments	BL4-Analyze	2
Experiment -4	To study about selective laser sintering	Experiments	BL4-Analyze	2
Experiment -5	Study of Shape Deposition Manufacturing Process Description	Experiments	BL4-Analyze	2
Experiment -6	Study and demonstration of 3D	Experiments	BL4-Analyze	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Chua C.K., Leong K.F., and Lim C.S Rapid prototyping: Principles and applications, Third edition, World Scientific Publishers, Gebhardt A Rapid prototyping Hanser Gardener Publications,
Articles	
References Books	Kamrani A.K. and Nasr E. A Rapid Prototyping: Theory and practice Springer Liou L.W. and Liou F.W Rapid Prototyping and Engineering applications: A tool box for prototype development CRC Press
MOOC Courses	https://www.coursera.org/courses?query=additive%20manufacturing
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	-	2	-	-	-	-	-	-	2	3	3	3
CO2	3	3	3	3	3	2	-	-	-	1	3	1	3	3	3
CO3	-	1	-	3	2	2	-	1	-	1	3	3	2	3	3
CO4	3	3	3	3	3	-	-	1	-	2	2	-	3	-	3
CO5	-	3	3	3	3	-	-	-	-	3	3	2	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Industrial Engineering
Course Code	MEL0409[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of basic science and production engineering.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** Understand the concepts of work and motion study**(BL2-Understand)** **CO2-** Apply the concepts of work and motion study to improve productivity.**(BL3-Apply)** **CO3-** Describe the methods of job evaluation and wage incentive.**(BL5-Evaluate)** **CO4-** Understand and apply methods of inspection and quality control.**(BL3-Apply)** **CO5-** Understand and apply PERT and CPM.**(BL3-Apply)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG11(Sustainable cities and economies)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Productivity & Work Study Definition of productivity, work content, ineffective time, productivity and standard of living, introduction to work Study Method Study: Objectives and procedure for methods analysis, recording techniques, principles of motion economy, micro-motion and Macro-motion study, Therbligs and SIMO Chart.	Lectures with Problem solving methodology, Quiz, Group discussion	8
Unit-2	Work Measurement Objectives, work measurement techniques, time study, work sampling, pre-determined motion time standards (PMTS), determination of time standards, observed time, basic time, normal time, rating factors, allowances, and standard time. Introduction to ergonomics.	Lectures with Problem solving methodology, Quiz, Group discussion	8
Unit-3	Job Evaluation and Wage Plan Objective, methods of job evaluation, job evaluation procedure, merit rating (performance appraisal), method of merit rating, wage and wage incentive plans.	Lectures with Problem solving methodology, Quiz, Group discussion	8
Unit-4	Inspection and Statistical Quality Control: Quality, quality control, costs of quality, inspection and quality control, SQC concept, variable and attributes, normal distribution curves and control charts for variable and attributes and their applications and interpretation (Analysis) process capability. Acceptance sampling, sampling plans, OC Curves and AOQ curves.	Lectures with Problem solving methodology, Quiz, Group discussion	8
Unit-5	Project Management Introduction to project management, Collaborative Working, PM Tutorials, Product development cycle overview; Market demands and trends for products; Product Lifecycle Management (PLM); Intellectual Property Rights (IPRs).	Lectures with Problem solving methodology, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. O.P. Khanna Industrial Engineering and Management Dhanpat Rai Publishing Co Pvt Ltd, 2. Ravi Shankar Industrial Engineering and Management Galgotia Publications Pvt Ltd, 3. Martand Telsang Industrial Engineering and Management Schand Publications
Articles	
References Books	1 Jay Heizer and Barry Render Operations Management Pearson Education, 2000 2 Mikell P. Groover and Michael M. Grieve Work Systems: The Methods, Measurement & Management of Work Pearson Education, 2013
MOOC Courses	https://onlinecourses.nptel.ac.in/noc22_me04/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	3	3	2	3	2	3	3	3	-	2	3	3
CO2	1	2	3	3	3	2	3	2	3	3	3	-	2	3	3
CO3	1	3	2	3	-	-	-	-	-	3	-	-	2	3	3
CO4	-	3	-	3	2	-	2	-	3	3	3	1	3	3	3
CO5	1	3	2	3	-	-	-	-	-	3	3	-	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Machining processes
Course Code	MEL0442[T]

Part A

Year	2nd	**Semester**	4th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Knowledge of material science and manufacturing processes			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To get the fundamentals of various machining operations.**(BL1-Remember)** **CO2-** To understand the basic concept of metal cutting mechanism.**(BL2-Understand)** **CO3-** To implement the mechanism of machining in different machines.**(BL3-Apply)** **CO4-** To analyze the different parameters used in machining operations.**(BL4-Analyze)** **CO5-** To evaluate different forces which act during the machining.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Metal Cutting: Economics of machines, introduction to machining processes, classification, mechanics of chip formation process, concept of shear angle, chip contraction and cutting forces in metal cutting, Merchant theory, tool wear, tool life, machinability. Fundamentals of measurement of cutting forces and chip tool interface temperature.	Lectures with whiteboard/PPT, Quiz, Group discussion	11
Unit 2	Cutting Tools: Types, geometry of single point cutting tool, twist drill and milling cutter, tool signature. Cutting Tool Materials: Classification of cutting tool materials and properties, tool insert, Selection of machining parameters. Coolants and lubricants: classification, purpose, function and properties.	Lectures with whiteboard/PPT, Quiz, Group discussion	10
Unit 3	Machine Tools Lathe: Classification, description and operations, kinematic scheme of lathe, and lathe attachments. Speed, feed and machine time calculations. Shaping And Planning Machine: Classification, description and operations. Milling Machine: Classification, description and operations, indexing devices, up milling and down milling.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit 4	Drilling Machine: Classification, description and operations. Speed, feed and machine time calculations. Boring Machine: Classification, description and operations. Broaching Machine: Classification, description and operations.	Lectures with whiteboard/PPT, Quiz, Group discussion	7
Unit 5	Grinding Machines: Classification, description and operations, grinding wheel composition, nomenclature of grinding wheels. Jigs and Fixtures: Locating and clamping devices, principles of jigs and fixtures, classification and application.	Lectures with whiteboard/PPT, Quiz, Group discussion	6

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment 1	Study of different parts of lathe machine	Experiments	BL2-Understand	2
Experiment 2	To perform Facing, Turning and Taper turning operations on the given work piece.	Experiments	BL5-Evaluate	2
Experiment 3	To perform thread cutting and knurling operation on the given work piece.	Experiments	BL5-Evaluate	2
Experiment 4	Study of different parts of Shaper machine	Experiments	BL2-Understand	2
Experiment 5	To perform the operations on Shaper machine.	Experiments	BL5-Evaluate	2
Experiment 6	Study of different parts of Milling machine	Experiments	BL2-Understand	2
Experiment 7	To perform the operations on Milling machine.	Experiments	BL5-Evaluate	2
Experiment 8	To perform the operations on Drilling machine.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Ghosh and Mallick Manufacturing Science East West Press, 2010 Dr. P. C. Sharma Manufacturing Technology-II S. Chand & Company Ltd.
Articles	
References Books	P. C. Pandey Production Engineering Science Standard Publishers, 2010 P. N. Rao Manufacturing Technology Vol. II Tata McGraw–Hill, New Delhi, 2009 P M Groover Fundamental of modern manufacturing, Processes And System John Wiley and Sons, 2010
MOOC Courses	https://archive.nptel.ac.in/courses/112/104/112104290/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	2	1	2	2	3	3	3	-	-	3	3	3
CO2	3	-	2	2	-	2	2	-	1	3	-	-	3	3	3
CO3	3	2	2	2	1	2	2	-	-	-	-	-	3	2	3
CO4	3	2	3	2	1	-	1	-	-	-	-	-	2	-	3
CO5	3	1	2	2	1	-	1	-	-	-	-	-	2	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Advanced Manufacturing
Course Code	MEL0522[T]

Part A

Year	3rd	**Semester**	5th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Information about basic manufacturing processs.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall the concepts of manufacturing, material science, Production, Engineering Mechanics.**(BL1-Remember)** **CO2-** To understating the concept of advanced machining process i.e. USM, AJM, WJM, AWJM, ECM, EDM, EBM, and LBM.**(BL2-Understand)** **CO3-** To apply the concept of Advanced casting process i.e. Metal mould casting.**(BL3-Apply)** **CO4-** To analysis of Advanced welding process i.e. EBW, LBM, USW, Plasma arc welding.**(BL4-Analyze)** **CO5-** To evaluation of Advanced Metal Forming & Finishing Processes.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Advanced Machining Processes Limitations of conventional manufacturing processes, Need and classification of unconventional or advanced manufacturing processes, Process Principle, Parametric analysis and applications of processes such as ultrasonic machining (USM), Abrasive jet matching (AJM), Water jet machining(WJM), Abrasive water jet machining (AWJM), Electrochemical machining (ECM), Electro discharge machining (EDM), Electron beam machining (EBM), Laser beam machining (LBM) Processes.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-2	Advanced Casting Processes Metal mould casting, Continuous Casting, Squeeze casting, Vacuum mould casting, Evaporative pattern casting, Ceramic shell casting , High pressure die casting process and study of injection chamber (HPDC).	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-3	Advanced Welding Processes Details of electron beam welding (EBW), laser beam welding (LBW), ultrasonic welding (USW), Plasma Arc Welding.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-4	Advanced Metal Forming Processes Details of high energy rate forming (HERF) process, electro- magnetic forming, explosive forming, Electro-hydraulic forming, Stretch forming, Contour roll forming,	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Advanced Finishing Processes Need, classification, process principle and applications of Abrasive Flow Finishing, Magnetic Abrasive Flow Finishing (MAFF) , Magnetic Abrasive Finishing (MAF) .	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	0
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
			0		0

Part E

Books	Benedict G.F. Non-Traditional Manufacturing Processes Marcel Dekker
Articles	
References Books	Jain V. K. Advance Machining Processes, Allied Publisher.
MOOC Courses	https://archive.nptel.ac.in/courses/112/107/112107078/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	1	-	-	-	-	-	-	-	-	2	-	3
CO2	3	3	-	3	-	-	-	-	-	3	2	-	3	3	3
CO3	2	2	-	3	-	-	-	-	-	3	2	-	3	3	3
CO4	3	3	-	3	-	-	-	-	-	3	2	-	3	3	3
CO5	3	3	-	3	-	-	-	-	-	3	3	-	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Operations Research
Course Code	MEL0626[T]

Part A

Year	3rd	**Semester**	6th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of linear equation, Engineering mathematics and industrial engineering.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall the industrial engineering**(BL1-Remember)** **CO2-** To understand the Performance of queue, line balancing**(BL2-Understand)** **CO3-** To apply the queuing theory and game theory**(BL3-Apply)** **CO4-** To measures how effective production system (supply system)**(BL4-Analyze)** **CO5-** To evaluate the production system (supply system). **(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Linear Programming Meaning of Linear Programming, General Mathematical Formulation of LPP, Graphical Analysis, Simplex Method, Two-phase Method, Big M-Method; Duality and Post Optimality Analysis Advantage and Limitations of LPP	Lectures with white board and PPT, Report writing	8
Unit-2	Transportation Model Mathematical Formulation, Initial Basic Feasible Solution, Vogel's Approximation Method, Optimization (Minimization and Maximization) Using Modified Distribution Method and Stepping Stone Method Assignment Problem Quiz, Seminar, Assignment Model as a Particular Case of Transportation Model, Formulation of Assignment Problems, Solution of Assignment Problems Using Hungarian Method (Minimization and Maximization) Route Allocation..	Lectures with white board and PPT, Quiz, seminar, Poster and PPT	8
Unit-3	Waiting Line Models Introduction, Scope in Management Decisions, Queuing Models M/M/1 (Infinite and Finite Population), Probability Calculations arid Application of M/M/C (Infinite Population) Replacement Models Introduction Scope in Management, Single Equipment Replacement Model and Group Replacement	Lectures with white board and PPT, Quiz, seminar, Poster and PPT	8
Unit-4	Game Theory Introduction to Games, Maximin and Minimax Principles, Pure and Mixed Strategies, Solution of Games Using-Algebraic and Graphical Methods; Linear programming approach for game theory Simulation & Computer Solutions Introduction to simulation, Monte Carlo Technique and Its Applications	Lectures with white board and PPT, Quiz, seminar, Poster and PPT	8
Unit-5	Inventory Models: Economic Order Quantity, Economic Production Order, Models with Price Breaks, Lead Times, Stockouts. Fixed time Period Models with Specified Probability of stock-outs & Service levels. Dynamic Programming Nature of Dynamic Programming Problem, Dynamic Programming Solutions for Knap Sack, Traveling Salesman (Stage Coach), Assignment of Salesmen to Sales Area and Capital Budgeting	Lectures with white board and PPT, Quiz, seminar, Poster and PPT	8

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	1. Gupta & Hira, Operations Research S. Chand & Company
Articles	
References Books	[1] Gupta & Hira, Operations Research, S. Chand & Company [2] Taha Operations Research, Pearson Education [3] Kedar Nath and Ram Nath, Operations Research, Publishers [4] Philips Ravindran, Operations Research, Solberg Wiley India Pvt. Limited.
MOOC Courses	https://onlinecourses.nptel.ac.in/noc22_ma48/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	2	2	-	-	3	3	-	-	3	2	2
CO2	3	1	2	2	2	-	-	-	3	3	1	-	3	3	3
CO3	1	2	2	2	1	-	-	-	-	1	-	3	2	3	2
CO4	1	3	2	3	2	-	3	2	-	-	2	2	2	2	2
CO5	-	1	1	2	2	-	-	-	-	-	2	-	1	2	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Total Quality Management
Course Code	MEL0727[T]

Part A

Year	4th	**Semester**	7th	**Credits**	L	T	P	C
					2	1	0	3
Course Type	Theory only							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of Probability & Statistics			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To recall industrial engineering and operation research**(BL1-Remember)** **CO2-** To understand the history of TQM**(BL2-Understand)** **CO3-** To apply the theories of TQM in real life industrial problems**(BL3-Apply)** **CO4-** To analyze the change in productivity through principles of TQM.**(BL4-Analyze)** **CO5-** To evaluate the different ways and theories of TQM**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✕ Professional Ethics ✓ Gender ✕ Human Values ✓ Environment ✕		**SDG (Goals)**	SDG8(Decent work and economic growth) SDG12(Responsible consuption and production)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Evolution of Quality Historical Perspective, Basic Concepts of Quality, Vision, Mission and Objectives of an Organization, Corporate Structure in an Organization and Role of Quality	Lectures with whiteboard/PPT, Quiz, Group discussion	
Unit-2	Quality Quality Planning, Quality By Design, Quality Costs and Cost of Failure, Waste Control, How Quality Benefits Business, Quality and Competitiveness in Business, Zero Defects and Continuous Improvement	Lectures with whiteboard/PPT, Quiz, Group discussion	
Unit-3	Total Quality Concepts and Total Preventive Maintenance CWQC, Product Liability Difference in Western And Japanese Approach of TQM, Basic Philosophy and Fundamental Models of TQM, Total Quality and Ethics, Internal Politics and Total Quality Management, Quality Culture, Education and Training, Implementing Total Quality Management An Integrated System Approach, Total Preventive Maintenance—Self Assessment	Lectures with whiteboard/PPT, Quiz, Group discussion	
Unit-4	Leadership Leadership Role of Leadership and Commitment in Quality Deployment, Team Building, Motivation, and Rewards, Total Employee Empowerment, Quality Functions Measurement, Inspection, Testing, Calibration and Assurance	Lectures with whiteboard/PPT, Quiz, Group discussion	
Unit-5	Design Control and Conformity, Tolerance and Variability PDCA Cycle, Juran Trilogy, Crosby's 10 points and Deming's 14 Points Customers Requirements, Customer Supplier and Chain Links, Establishing Customer Focus Customer, Satisfaction, Measurement and Customer Retention	Lectures with whiteboard/PPT, Quiz, Group discussion	

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**

Part E

Books	Joel E. Ross Total Quality Management: Text, Cases, and Readings Routledge
Articles	
References Books	R. Panneerselvam Total Quality Management: Key Concepts and Case Studies Prentice Hall India
MOOC Courses	https://onlinecourses.nptel.ac.in/noc20_mg34/preview
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	2	3	-	-	2	1	-	2	2	-	3	-	3
CO2	3	2	2	3	-	2	3	1	3	3	3	-	3	3	3
CO3	3	3	2	3	-	2	3	1	3	3	3	-	3	3	3
CO4	3	3	3	3	2	2	3	1	3	3	3	1	3	3	3
CO5	3	3	3	3	2	2	3	1	3	3	3	1	3	3	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	Automobile Engineering
Course Code	MEL0825[T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Basic knowledge of engine parts. body of vehicle and thermodynamics.			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To remember basic parts of I C Engines**(BL1-Remember)** **CO2-** To Understand Transmission and Braking system**(BL2-Understand)** **CO3-** To Apply the knowledge of Braking System & Electrical System. in automobile**(BL3-Apply)** **CO4-** To analyze the braking and suspension system in automobile. **(BL4-Analyze)** **CO5-** To evaluated and summarize the braking, suspension, power transmission and Automobile Air Conditioning..**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✓		**SDG (Goals)**	SDG7(Affordable and clean energy) SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit-1	Power Unit: Design and Principles of major components, valve mechanism, power and torque characteristics, rolling, air and gradient resistance, tractive effort, gearbox, gear ratio determination, design of gear box.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-2	Transmission: Requirements, clutches, torque converters, overdrive and free wheel, universaljoint, differential gear mechanism of rear axle, automatic transmission, steering, and front axle, castor angle, wheel camber and toe-in, toe-out etc, steering geometry, Ackerman mechanism, under steer and over steer.	Lectures with whiteboard/PPT, Quiz, Group discussion Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-3	Braking System: General requirements, Road tyre adhesion, weight transfer, braking ratio, mechanical brakes, hydraulic Chassis and Suspension System: Loads on the frame, strength and stiffness,brakes, vacuum and air brakes, thermal aspects. Electrical System: Types of starting motors, generator and regulators, lighting system, ignition system, horn, battery.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-4	Introduction to Electric Vehicles: Electric Vehicle – Need – Types, Electric Vehicle Technology – layouts, Batteries – overview and its types. Charging – Methods and Standards. Alternate charging sources – Wireless & Solar, Hybrid Electric vehicles – Classification – Micro, Mild, Full, Plug-in, EV.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit-5	Automobile Air Conditioning: Requirements, cooling and heating systems. Cooling and lubrication System: Different type of cooling system and lubrication system Fuel Supply System: Diesel & Petrol vehicle system such as fuel injection pump, injector and fuel pump, carburetor, MPFI	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment-1	To Study of Automobile Chasis.	Experiments	BL2-Understand	2
Experiment-2	To Study of differential mechanism of an Automobile	Experiments	BL2-Understand	2
Experiment-3	To Study of multiple clutch of an Automobile.	Experiments	BL2-Understand	2
Experiment-4	To Study and demonstration of different circuit of carburettor.	Experiments	BL2-Understand	2
Experiment-5	To Study of the electrical system of Automobile.	Experiments	BL2-Understand	2
Experiment-6	To Study of the Torque convertor.	Experiments	BL2-Understand	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	1. Automobile Engineering, Kripal Singh 2. Automotive Engineering, Hietner 3 Automotive Mechanics, Crouse
Articles	
References Books	1. Automobile Engineering,Narang 2. Automobile Engineering, Newton and Steeds. 3 Jack Erjavec and Jeff Arias, “Hybrid, Electric and Fuel Cell Vehicles”, Cengage Learning, 2012
MOOC Courses	https://archive.nptel.ac.in/courses/107/106/107106088/
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	2	-	-	3	3	-	-	3	-	2
CO2	2	-	1	2	1	2	-	-	3	3	-	-	3	2	2
CO3	1	-	2	1	1	-	-	-	2	1	-	-	3	2	2
CO4	-	1	2	3	1	-	-	-	-	-	-	-	3	-	2
CO5	-	1	1	2	1	-	-	-	-	-	-	-	3	-	2
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Syllabus-2023-2024

BTech-MechanicalEngineering

Title of the Course	CNC and Flexible Manufacturing Systems
Course Code	MEL0827[T]

Part A

Year	4th	**Semester**	8th	**Credits**	L	T	P	C
					2	1	1	4
Course Type	Embedded theory and lab							
Course Category	Discipline Core							
Pre-Requisite/s	Conventional machining process and production system			**Co-Requisite/s**				
Course Outcomes & Bloom's Level	**CO1-** To get the fundamentals of various types of CNC operations and production systems.**(BL1-Remember)** **CO2-** To understand the Basic concept of G codes, M codes for programming.**(BL2-Understand)** **CO3-** To implement G codes, M codes in programming.**(BL3-Apply)** **CO4-** To analyze the CNC program.**(BL4-Analyze)** **CO5-** To evaluate and summarize the CNC program.**(BL5-Evaluate)**							
Coures Elements	Skill Development ✓ Entrepreneurship ✓ Employability ✓ Professional Ethics ✕ Gender ✕ Human Values ✕ Environment ✕		**SDG (Goals)**	SDG9(Industry Innovation and Infrastructure)				

Part B

Modules	Contents	Pedagogy	Hours
Unit 1	Introduction to CNC Machine Tools: Development of CNC Technology-Principles and classification of CNC machines, Advantages & economic benefits, Types of control, CNC controllers, Characteristics, Interpolators, Applications, DNC concept.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit 2	CNC Programming: Co-ordinate System, Fundamentals of APT programming, Manual part programming-structure of part programme, G & M Codes, developing simple part programmes, Parametric programming, CAM packages for CNC machines-IDEAS, Unigraphics, Pro Engineer, CATIA, ESPIRIT, Mastercam etc., and use of standard controllers- FANUC, Heidenheimer and Sonometric control system.	Lectures with whiteboard/PPT, Quiz, Group discussion	10
Unit 3	Tooling for CNC Machines: Cutting tool materials, Carbide inserts classification; Qualified, semi- qualified and preset tooling, Cooling fed tooling system, Quick change tooling system, Tooling systemfor machining center and turning center, tool holders, Tool assemblies, Tool magazines, ATC mechanisms, Tool management.	Lectures with whiteboard/PPT, Quiz, Group discussion	9
Unit 4	Robotics and Material Handling Systems: Introduction to robotic technology, and applications, Robot anatomy, material handling function, Types of material handling equipment, Conveyer systems, Automated guided vehicle systems, Automated storage/retrieval systems, Work-in-process storage, Interfacing handling and storage with manufacturing.	Lectures with whiteboard/PPT, Quiz, Group discussion	8
Unit 5	Group Technology and Flexible Manufacturing System: group Technology-part families, Parts classification and coding, Production flow analysis, Machine Cell Design, Benefits of Group Technology, Flexible manufacturing systems-Introduction, FMS workstations, Computer control system, Planning for FMS, Applications and benefits.	Lectures with whiteboard/PPT, Quiz, Group discussion	8

Part C

Modules	Title	Indicative-ABCA/PBL/ Experiments/Field work/ Internships	Bloom's Level	Hours
Experiment 1	To study the features of CNC machine tool.	Experiments	BL2-Understand	2
Experiment 2	To perform facing and turning operations on the given work piece.	Experiments	BL5-Evaluate	2
Experiment 3	To perform the multiple turning operation on the given work piece.	Experiments	BL5-Evaluate	2
Experiment 4	To perform the drilling operation on the given work piece.	Experiments	BL5-Evaluate	2
Experiment 5	To perform the boaring operation on the given work piece.	Experiments	BL5-Evaluate	2
Experiment 6	To perform the grooving operation on the given work piece.	Experiments	BL5-Evaluate	2
Experiment 7	To perform the threading operation on the given work piece.	Experiments	BL5-Evaluate	2

Part D(Marks Distribution)

Theory					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	40	40	12	60	
Practical					
Total Marks	**Minimum Passing Marks**	**External Evaluation**	**Min. External Evaluation**	**Internal Evaluation**	**Min. Internal Evaluation**
100	50	40	20	60	

Part E

Books	Machines P. Radahkrishnan Computer Numerical Control New Central Book Agency H.K. Shivanand, M.M. Benal, V. Koti Flexible Manufacturing System New age international publishers
Articles	
References Books	M.S. Sehrawat and J.S. Narang CNC Machines Dhanpat Rai and Co. Prof. S. K. Sinha CNC Programming using Fanuc Custom Macro McGraw Hill, 2001
MOOC Courses	https://www.mooc-list.com/tags/automotive-engineering
Videos	

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	2	2	2	2	1	3	1	-	-	3	3	3
CO2	2	-	-	2	1	2	-	-	1	1	-	-	3	2	3
CO3	2	1	2	2	2	2	-	-	-	-	-	-	3	2	3
CO4	2	2	2	2	1	-	-	-	-	-	-	-	2	-	3
CO5	2	1	1	2	2	-	-	-	-	-	-	-	2	-	3
CO6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-