VEERMATA JIAJABAI TECHNOLOGICAL INSTITUTE, MUMBAI

Circular / Open Elective / Semester I/ AY 2024-25 /01 Date 20th September 2024

Course Name, Detail Curriculum and Eligibility criteria of Open Elective Courses to be offered for I semester of the Academic Year 2024-25 are given below. Students are requested to submit google form for open elective of semester I (from 20th September 2024 to 27th September 2024).

Link of Google form: https://forms.gle/fho5QGAW1wdATqwp9

Rules:

1. Once selected, the course will not be changed under any circumstances. Therefore students should be careful while selecting the course
2. In case number of students opting for a particular course is less than 25, the course will be not being offered.
3. Opting open elective from other department is mandatory.
4. Students should not study same course as core/programme elective and open elective. E.g, Students of M.Tech (CAD/CAM) having Robotics and Automation as core course should not opt for Robotics open elective.

Associate Dean Academics

Open Elective at Institute Level (M. Tech I Semester AY 2024-25)

Sr. No	Course Title	Department Offering Elective Course
1	Sustainable Development	Civil
2	Database Management Systems	Computer
3	3D Printing	Mechanical
4	Artificial Neural Networks and Machine Learning	Electrical
5	Entrepreneurship & Development	Production
6	Continuum Solid Mechanics	Structural

Interdisciplinary Open Elective Course 01: Sustainable Development								
SN	**Course Code**	**Course Title**	**L-T-P (Hours/Week)**	**Credit**	**TA**	**IST**	**ESE**	**ESE hours**
2	**CECM5061S-B**	**Sustainable Development**	3-0-0=3	3	20	20	60	3

Course Outcomes:

After completion of course students will be able to
CO1: Describe sustainable development, development processes and relate impact of various levels of development
CO2: Formulate the methodology for assessment of sustainability of project using various indicators.
CO3: Apply environmental legislations to various development processes and projects

1 Development
Goals and means of development, MDG's and SDG's sustainable development, Comparing levels of development, GDP, GNP, global development level
2 Industrialization and Post-industrialization era
Major structural shifts, knowledge revolution, implications for development sustainability
3 Environmental episodes
Ozone depletion, global warming, greenhouse effect, Bhopal gas tragedy etc
4 Pollutions
Major sources, permissible standards and controls of urban air pollution, water pollution, Solid and hazardous waste disposals
5 Climate Change and the various industrial sectors
The Risk of Global Climate Change, impact of CC & CN due to various industrial sectors
6 Environmental legislations
Legislative provisions and measures towards sustainability
7 Indicators of Development Sustainability
Composition of National wealth, Accumulation of National Wealth as an Indicator of Sustainable Development, Development Goals and Strategies**,** Gross happiness index, Millennium Development Goals, Role of National Development Policies, Life cycle assessment, Carbon foot print

References Books:
1 Tatyana P. Soubbotina, Beyond Economic Growth: An Introduction to Sustainable Development, World Bank Institute Learning Resources Series, 2Nd edition, 2004. (ISBN: 08213-5933-99)
2 P. P. Roger, F. J. Jalal and J. A. Boyd, An Introduction to Sustainable Development, Earthscan Publications, 2nd edition, 2008. (ISBN: 9781844075201/1844075206)

Reference Books:
1 T. Strange and A. Bayley, Sustainable Development: Linking Economy, Society, Environment, 2008. (ISBN: 9789264047785)
2 H. G. Brauch, Sustainable Development and Sustainability Transition Studies, Series: Springer Briefs in Environment, Security, Development and Peace, Series Ed.
3 G. Marletto, S. Franceschini, C. Ortolani and C. Sillig, Mapping Sustainability Transitions: Networks of Innovators, Techno-economic Competences and Political Discourses, Springer Briefs in Business, 2016. (ISBN: 9783319422725/9783319422749)

Programme Name	M. Tech. Computer Engineering
Course Code	COCE5061S
Course Title	Database Management Systems
Course Type	Open Elective

Prerequisites: Nil.

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

CO1. Differentiate various database architectures.
CO2. Design and implement relational databases.
CO3. Execute MongoDB commands to manipulate data.
CO4. Use advanced XML queries on database.
CO5. Apply practices of implementing database security.
CO6. Perform transaction processing and achieve concurrency control.

	Course Contents	Hrs.	CO
1.	**Introduction to Database Management Systems and Enhanced Data Models for Advanced Applications:** Characteristics of database, Database users, Advantages of DBMS, Data Models, Schema and Instances, Three schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client / Server Architecture for DBMS. Introduction to Temporal Database and Multimedia Databases.	4	CO1
2	**Relational-Database Design and SQL:** Functional dependencies, Normalisation forms, Decomposition, Overall database design process. SQL: DDL: Create, Modify, Alter, Drop, View definition, etc.DML: SELECT, INSERT, DELETE, Update, Nested Query, SQL with SET operations: Union, Intersect, Except, etc, Ag- gregate Functions: Group By, Having, SUM, etc, SQL with Logical operations, Nested and Complex Queries, Join Queries. DCL : GRANT, REVOKE, etc DBA level query. Cursors and Triggers, Procedures and Functions, Partitions, SQL Backup and Recovery.	8	CO2
3.	**Introduction to NoSQL Databases:** Introduction, Design of parallel systems, Parallel query processing. Avenues for parallelism, Array and vector processors. Multiprocessor architecture: taxonomy of parallel architectures, Parallel Query Evaluation. Advanced Transaction Processing Non-relational DBMS: consistency and availability trade-offs, NoSQL DBMS (key-value, document, and graph), MongoDB: CRUD operations.	8	CO3

4.	**XML Databases:** Introduction to XML Documents and Databases, XML schemas, tree structure, and DOM, XML Query.	6	CO4
5.	**Database Security:** Introduction to major database attacks: SQL Injection, DoS/DDoS etc. Encryption and Public Key Infrastructures.	4	CO5
6.	**Transaction Processing and Concurrency Control:** Schedules and serializability, Lock management, Compensation and Databases, Deadlock Handling, Multiple granularity, validation protocols, multi-version protocols, snap shot isolation, predicate locking, Weak Levels of Consistency in Practice.	8	CO6

Text Books

1.	Elmasri, Navathe. Fundamentals of Database Management systems, Pearson Education, 2008.
2.	Avi Silberschatz, Henry F. Korth, S. Sudarshan. Database System Concepts, Seventh Edition, McGraw-Hill, 2010.
3.	P. Sadalage and M. Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Addison Wesley, 2012.

Reference Books

1.	Thomas Connolly and Carolyn Begg, "Database Systems" 3rd Edition, Addison-Wesley, 2005.
2.	V.S. Subrahmanian, "Multimedia database systems", Springer, 1996.

Programme Name	**Masters of Technology in Mechanical Engineering with Specialization in CAD/CAM & Automation**
Course Code	**MECC5061S**
Course Title	**3D Printing**

Course Outcomes

After completion of course, students would be able to

1. Understand and evaluate various existing Product Development processes
2. Develop new technologies in the field Rapid Prototyping Manufacturing
3. Generate innovative ideas to reduce time and cost by developing newmethods and materials for the modern manufacturing industry.

Course Contents

Rapid Product Development

Product Developing Cycle, Definition of Rapid Product Development, Virtual prototypical and rapid manufacturing technologies, Physical Prototyping & rapid manufacturing technologies, Synergic integration technologies

Rapid Prototyping Processes

Principal of Rapid Prototyping, Various RP technologies, Selection of a suitable RP process for a given application, Status of outstanding issue in RP- accuracy, speed, materials (strength, homogeneity and isotropy), Emerging Trends

Rapid Tooling

Introduction to Rapid Tooling, Indirect Rapid Tooling Processes, Direct Rapid ToolingProcesses, Emerging Trends in Rapid Tooling

Reverse Engineering

Data Extraction, Data Processing

Applications and Case Studies

Engineering Applications, Medical Applications

Processing of Polyhedral Data

Polyhedral BRep modeling, Introduction to STL format, Defects and repair of STL files,Overview of the algorithms required for RP&Tand Reverse Engineering

Laboratory and Demonstration Sessions

Exercise using 3D CAD software,Preparation STL files processing, Making models on FDM RP machine, Demonstration of Silicon Rubber Molding and Application of post processing techniques on FDM parts.

Recommended Reading

1. Chua Chee Kai and Leong Kah Fai, Rapid Prototyping Principles and Applications in Manufacturing, John Wiley & Sons, 1997.

2. K.P.Karunakaran,Rapid Product Development & Manufacturing, IIT, Bombay, 1st edition, 2013.
3. Peter D. Hilton and Paul F. Jacobs (Editors.), Rapid Tooling Technologies and Industrial Applications, Marcel Dekker. 4th edition, 2000.
4. Todd Grimm,User's Guide to Rapid Prototyping, Society of Manufacturing Engineers, 1st edition, 2004.
5. Paul F. Jacobs,Stereo-lithography and Other RP&M Technologies from Rapid Prototyping to Rapid Tooling, SME/ASME, 1996.
6. N. Hopkinson, R. J. M. Hague, and P.M. Dickens,Rapid Manufacturing , An Industrial Revolution for the digital age, John Wiley & Sons, Ltd, 2nd edition, 2006.
7. Ken Pimentel, Kevin Teixeira,Virtual Reality, Windcrest/McGraw-Hill, 1st edition, 2003.
8. Andreas Gebharatdt,Rapid Prototyping, Hanser Publishers,2nd edition – 2003.
9. RafiqNoorani, Rapid Prototyping Principles and Applications, John Wiley & Sons -1st edition, 2006.
10. Wasim Ahmed Khan, Abdul Raouf, Kai Cheng, Virtual Manufacturing, Springer, 2011

Programme Name	**M. Tech. (IoT), SEMESTER-I (Open Elective)**
Course Code	EEIT5061S
Course Title	**ARTIFICIAL NEURAL NETWORKS AND MACHINE LEARNING**

COURSE OBJECTIVE

The course is designed to introduce the field of neural network systems and Artificial Neural Networks. The basic concepts of machine learning are also the main goal of this subject.

COURSE OUTCOME

Students will be able to understand the fundamental concepts of the neural network systems.This area new field of research thus students will get to know about the recent trends in research fields.

Module 1: Introduction: Biological neurons and memory
Structure and function of a single neuron; Artificial Neural Networks (ANN);Typical applications of ANNs : Classification, Clustering, Vector Quantization, Pattern Recognition, Function Approximation, Forecasting, Control, Optimization.
Module 2: Supervised Learning

Single-layer networks; Perceptron-Linear separability, Training algorithm, Limitations; multi-layer networks-Architecture, Back Propagation Algorithm (BTA) Adaptive Multi-layer networks-Architecture, training algorithms; Recurrent Networks; Feed-forward networks;Radial-Basis-Function (RBF) networks;
Module 3: Unsupervised Learning
Winner-takes-all networks; Hamming networks; Maxnet; Simple competitive learning; Vector-Quantization; Counter propagation networks; Adaptive ResonanceTheory; Kohonen'sSelf-organizing Maps; Principal Component Analysis.
Module 4: Associated Models and Optimization Methods
Hopfield Networks, Brain-in-a-Box network; Boltzmann machine; Hopfield Networks for- TSP, Solution of simultaneous linear equations; Iterated Gradient Descent; Simulated Annealing; Genetic Algorithm.
Module 5: Introductory Material to Machine Learning and AI
Motivations for Studying ML, Supervised and Unsupervised learning, Machine Learning in the Large
Module 6: Classical and Theoretical ML Topics
Concept Learning (also called Learning from Examples), Learning from Analogy, Explanation Based Learning, Structure Learning, Reinforcement Learning, Decision Tree Learning, Decision List Learning , Oracle Based Learning, Probably Approximately Correct (PAC) Model, Boosting, Bayesian Learning: Maximum Likelihood Estimates, ParameterEstimation, Bayesian Belief Networks
Expectation Maximization as a fundamental technique, Hidden Markov Models (HMM): Motivation for Generative Models, Forward-backward Algorithm, BaumWelch Iteration, Feature Enhanced HMM.
Module 8: Maximum Entropy Markov Models (MEMM)
Motivation for Discriminative Models, Training of MEMMs (v) Introductory Optimization Based Methods: Neural Nets, Support Vector Machines, GeneticAlgorithms (v) Applications: Text Learning, Speech Processing, Data Mining, Bioinformatics

Reference Books:

1. Simon Haykin, "Neural Networks - A Comprehensive Foundation", Macmillan Publishing Co., New York, 1994.
2. A Cichocki and R. Unbehauen, "Neural Networks for Optimization and Signal Processing", John Wiley and Sons, 1993
3. J. M. Zurada, "Introduction to Artificial Neural Networks", (Indian edition) Jaico Publisher, Mumbai, 1997.
4. Hui Jiang, "Machine Learning Fundamentals: A Concise Introduction" Cambridge University Press, 2022
5. Alexander Jung, "Machine Learning: The Basics (Machine Learning: Foundations, Methodologies, and Applications)" Springer, 2022

Programme Name	M. Tech. (Civil Engineering with Specialization in Structural Engineering
Course Code	CESE5061S
Course Title	Continuum Solid Mechanics

COURSE OUTCOME:

After completion of this course students shall be able to

CO1: define basic definitions of modern continuum mechanics, such as deformations, strains, stress, constitutive equations of linear and non-linear materials.

CO2: apply basic elasticity formulation in 2-D and 3-D domains for rectangular and polar coordinate systems.

CO3: apply energy theorems for the elasticity solutions.

Introduction

Stress transformation and strain transformation at a point in an elastic body, 3D problems, rigid body translation and rotation of an element in space, formulation of generalized Hooke's law, derivation of displacement for a general displacement field u, v, w, evaluation of principal stresses and strains at a point. Tensor notations for stresses and strains at a point.

2-D Problems in Continuum Mechanics

Study of plane stress and plain strain idealizations of problems. Application of equilibrium and compatibility conditions to solve a problem of continuum mechanics. Application of boundary conditions and stress functions approach for solution of problems. 2-D problem formulation in rectangular coordinates, polynomial solutions and cantilever loaded at the end, simply supported beam under uniformly distributed load and linear loading. 2-D problem in polar coordinates, stress distribution about an axis, pure bending of curved bars, displacement for symmetrically loaded cases, bending of a curved bar by forces at end. Stress analysis of plates with circular hole due to in plane loading. Stress analysis in structures due to a concentrated load at a point of a straight boundary. Stress analysis of circular disks and wedges. 2-D formulation for stress analysis of prismatic bars of elliptical, rectangular, triangular and other sections subjected to torsion by Membrane Analogy.

Head of Department
Structural Engg.
V.J.T.I.
Mumbai - 400 019.

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3-D Problems in Continuum Mechanics

Application of equilibrium and compatibility conditions to 3-D problems in continuum mechanics. Problems of rods under axial stress, bar under its own weight and pure bending of prismatic rods. Bending of prismatic bars as a problem of continuum mechanics in 3-D. Bending of a cantilever, stress function for circular and rectangular sections of bars.

Energy Theorems

Applications of complementary energy theorems to the problems of continuum mechanics Case studies: Related to structural engineering problems.

Recommended Reading

1. Wang C. T., Applied Elasticity, McGraw Hill Book Co., 1953.
2. Timoshenko S. P. and Krieger S. W., Theory of Plates and Shells, McGraw Hill International Ed., 1959.
3. Timoshenko S. P. and Goodier J. N., Theory of Elasticity, McGraw Hill Book Company, International Ed., 1970.
4. Shames H. and Cozzarellie F. A., Elastic and Inelastic Stress Analysis, Prentice Hall New Jersey, 1992.
5. Chandrasekharaiah D. S. and Debnath L., Continuum Mechanics, Prism Books Pvt. Ltd., Bangalore, 1994.
6. Srinath L. S., Advanced Mechanics of Solids, Tata McGraw-Hill Education, 2009.
7. Boresi Arthur P., Chong K., Lee J. D., Elasticity in Engineering Mechanics, Wiley and Sons, 2011.
8. Budynas R. G., Advanced Strength and Applied Stress Analysis, WCB/McGraw-Hill, 1999.

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