Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information	
Programme	M. Tech. (Design Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	7OE503
Course Name	OE: Industrial Product Design
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 3			

Course Objectives	
1	To prepare the students to succeed as designer in industry /technical profession.
2	To provide students the knowledge of steps involved in design and developments of industrial Product.
3	To train the students to generate the idea for new product development based on the needs of Society.
4	To prepare the students to use knowledge of ergonomics , aesthetics for development of industrial Product.
5	To prepare the students to use knowledge of materials, economics, value analysis, standardization For development of industrial Product.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Generate and develop innovative ideas for industrial products based on societal needs.	III	Applying
CO2	Recommend appropriate process to apply aesthetical concepts to product.	V	Evaluating
CO3	Design and develop the products by using standardization.	VI	Creating
CO4	Understand the structure of design organizations and the role of designers within them.	II	Understanding

Module	**Module Contents**	**Hours**
I	Approach to industrial product based on idea generation and innovations to meet the creative process involved in idea marketing, designers, mind-criticism, design process, creation needs of the developing society. Design and development process of industrial products, various steps such as Ergonomics and aesthetic requirements of product design, quality and maintainability consideration in product design, Use of modelling technique, prototype designs, conceptual design.	8
II	General design situations, setting specifications, requirements and ratings, their importance in the design, Study of market requirements and manufacturing aspects of industrial designs. Aspects of ergonomic design of machine tools, testing equipment's, instruments, automobiles, process equipment etc. Convention of style, from and colour of industrial design.	8
III	Design of Consumer Product, Functions and use standard and legal requirements, body dimensions. Ergonomic considerations, interpretation of information, conversions for style, forms, colours.	6

IV	Aesthetic Concepts Concept of unity and order with variety, concept of purpose, style and environment, Aesthetic expressions of symmetry, balance, contrast and continuity, proportion, rhythm, radiation. From and style of product: visual effect of line and from, mechanics of seeing', psychology of seeing, influence of line and form, Components of style, Basic factors, Effect of colour on product appearance, colour composition, conversion of colours of engineering products.	7
V	Economic Considerations Selection of material, Design for production, use of standardization, value analysis and cost reduction, maintenance aspects in design.	5
VI	Design Organization Structure, Designer position, Drawing office procedure, Standardization, record keeping, legal procedure of Design patents.	5

Text Books	
1	W. H. Mayall, "Industrial Design for Engineers", Illife, 1967.
2	Hearn Buck. "Problems of Product Design and Development", Pergamon press, Jan 1, 1963.
3	Charles H. Flueriche, "Industrial Designs in Engineering", Design council, 1983.

References	
1	Ezia Manzim "Material of Invention", Cambridge Mass: MIT press, 1989.
2	Percy H. Hill "The Science of Engineering Design", Holt McDougal, 1970

Useful Links	
1	https://www.youtube.com/watch?v=ANBqFUrUfOY
2	https://www.youtube.com/watch?v=0W_wGUf59UU
3	https://www.youtube.com/watch?v=HN9GtL21rb4&list=PLSGws_74K018yZOnbSaqWJZ837QyBB7vu
4	https://youtu.be/oUeK6ZsCo8I

CO-PO Mapping

	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	1	1			3	2
CO2	3			1	1	1
CO3		2	2		2	1
CO4	2					2

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High
Each CO of the course must map to at least one PO.

Assessment (for Theory Course)

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information

Programme	M. Tech. (Thermal Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	7OE504
Course Name	Waste to Energy
Desired Requisites:	Environment Studies, Elements of Mechanical Engineering, Thermodynamics

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	0 Hrs/week	30	20	50	100
		Credits: 3			

Course Objectives

1	To understand the grave problem of urban solid waste disposal and methods to tackle this problem.
2	To apply various energy conversion methods using biomass
3	To Study and analyze the biogas energy conversion process
4	To Study the Waste To Energy & Environmental Implications.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Describe various methods of conversion of waste to energy.	II	Understanding
CO2	Implement basic procedures for operating waste-to-energy conversion systems.	III	Applying
CO3	Compare different waste-to-energy processes to determine their suitability for specific types of waste.	IV	Analysing
CO4	Critically assess the sustainability and regulatory compliance of waste-to-energy systems.	V	Evaluating

Module	**Module Contents**	**Hours**
I	Introduction – Waste production in different sectors such as domestic, industrial, agriculture, post-consumer, waste etc. Classification of waste-agro based, forest residues, domestic waste, industrial waste (hazardous and non-hazardous), Characterization of waste for energy utilization, Characterization of wastes, Waste to energy by incineration process, Incineration plant furnaces & boilers.	7
II	Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application. Manufacture of pyrolytic oils and gases, yields and applications	6
III	Biomass Gasification: Gasifiers- Fixed bed system- Downdraft and updraft gasifiers, Fluidized bed gasifiers- construction and operation – Gasifier burner arrangement for thermal heating. Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation	7
IV	Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, construction and operation.	7
V	Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features Biochemical conversion - anaerobic digestion - Types of biogas Plants Applications - Alcohol production from biomass - Bio diesel production.	6
VI	Waste To Energy & Environmental Implications- Environmental standards for waste to energy plant operations and gas clean-up. Savings on non-renewable fuel resources. Carbon Credits: Carbon foot calculations and carbon credits transfer mechanisms.	6

Textbooks

1	Energy Technology- S. Rao and B. B. Parulekar, Khanna Publication
2	S . P. Sukhatme, " Solar Energy", McGraw Hill Education, 3rd Edition,2015
References	
1	Annual Report 2006, Ministry of new and renewable energy, Government of India, New Delhi.
2	Energy Handbook, R. L. Loftness Van NOstrand Reinhold
3	H. Shah et al., Integrated renewable energy for rural development, 1990, Tata Mc Graw Hill.
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc20_ch16/preview

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1				2	3	
CO2				2	2	
CO3			2			
CO4					2	

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Walchand College of Engineering, Sangli

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AY 2024-25

Course Information

Programme	M.Tech. (Manufacturing Engineering)
Class, Semester	First Year M. Tech., Sem - II
Course Code	7OE505
Course Name	Advanced Production Systems
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 3			

Course Objectives

1	To impart the knowledge of the fundamentals in advanced production systems.
2	To prepare the student for the use of the recent developments in production systems and techniques for manufacturing
3	To develop the student for selection of appropriate production systems and techniques considering the advantages, limitations, cost economy, etc.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Recalling facts and basic concepts of earlier production systems and techniques	I	Remembering
CO2	Distinguish the elements and techniques in conventional and advanced production systems	II	Understanding
CO3	Identify appropriate production systems for manufacturing implementation	IV	Analysing
CO4	Recommend modern equipment's, techniques, tools and methodology for advanced production systems.	V	Evaluating

Module	**Module Contents**	**Hours**
I	Origin of CIM- the changing manufacturing and management scene - External communication - islands of automation and software-dedicated and open systems-manufacturing automation protocol - product related activities of a company- marketing engineering - production planning - plant operations - business and financial management	7
II	History of group technology- role of G.T. in CAD/CAM integration - part families - classification and coding - DCLASS and MICLASS and OPITZ coding systems-facility design using G.T. - benefits of G.T. - cellular manufacturing systems. Process planning - role of process planning in CAD/CAM integration - approaches to computer aided process planning – Types of CAPP	6
III	Shop floor control-phases -factory data collection system -automatic identification methods-Bar code technology-automated data collection system. FMS-components of FMS - types -FMS workstation -material handling and storage systems- Information flow in Shop floor control systems	7

IV	Designing database-Hierarchical Model-Network Approach-Relational Data Model-Concepts, Principles, Keys, Relational Operations-Functional Dependence-Normalization, Types - Query Languages.	7
V	CIM and company strategy - system modeling tools -IDEF models - activity cycle diagram CIM open system architecture (CIMOSA)- manufacturing enterprise wheel-CIM architecture- CIM implementation software. Communication fundamentals- local area networks -topology -LAN implementations – network management and installations	6
VI	Open systems - open system inter connection -manufacturing automations protocol and technical office protocol (MAP /TOP) Development of databases - Architecture of database systems - data modeling and data associations - relational data bases - database operators - advantages of data base and relational database.	6

Textbooks	
1	Mikell.P.Groover “Automation, Production Systems and computer integrated manufacturing”, Pearson Education 2008.
2	Groover M.P., "Automation, Production Systems and Computer Integrated Manufacturing", Prentice-Hall of India Pvt Ltd., Pearson Education, 2016
3	Kalpakjain, "Manufacturing Engineering and Technology", Pearson 2024.

References	
1	Ranky, Paul G., “Computer Integrated Manufacturing”, Prentice Hall International, 2010.
2	David D.Bedworth, Mark R.Hendersan, Phillip M.Wolfe “Computer Integrated Design and Manufacturing”, McGraw-Hill Inc 2008. 1991
3	Date.C.J, "An Introduction to Database Systems", Narosa Publishing House, 2004. 1991
4	Kerr.R, "Knowledge Based Manufacturing Management", Addison Wesley, 2003 1991

Useful Links	
1	https://nptel.ac.in/courses/112/107/112107078/
2	https://nptel.ac.in/courses/112/107/112107077/
3	https://nptel.ac.in/courses/110/106/110106044/

CO-PO Mapping

	Programme Outcomes (PO)					
	1	**2**	**3**	**4**	**5**	**6**
CO1	2	3				
CO2	1	2				
CO3		2	3			
CO4			2	2	2	

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High
Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher’s assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Walchand College of Engineering, Sangli

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AY 2023-24

Course Information

Programme	M. Tech. Control and Instrumentation
Class, Semester	First Year M. Tech., Sem. II
Course Code	1OE506
Course Name	Open Elective: Electrical Drives and Applications
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	--	30	20	50	100
		Credits: 3			

Course Objectives

1	To make students understand concept of fundamental knowledge in dynamics and control of Electric Drives.
2	To strengthen control principles of various DC and AC motors using solid state converters.
3	To cover principles of selection of Electric Motors and highlights the applications of Electrical Drives.
4	Update the modern control trends in the field of electrical drives.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Apply fundamental concepts in Electric drives.	III	Applying
CO2	Apply the control techniques for Electric drives for speed control.	III	Applying
CO3	Analyze the performance of various control techniques used in speed control of electric drives.	IV	Analyzing
CO4	Recommend the drives system for a particular application.	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Fundamentals of Electric Drives** Types & parts of the Electrical drives, Selection criteria of drives, motor rating, selection based on duty cycle, selection of converter rating, fundamental torque equation, speed torques characteristics DC motor & Induction motor, multi quadrant operation of the drive, classification of mechanical load torques, steady state stability of the drive, constant torque and constant HP operation of the drive, closed loop speed control.	7
II	**Power Converters for Electrical Drives** Single phase and three phase rectifiers, Single phase and three phase thyristorised converters, Control and performance of thyristorised converters, Single phase and three phase voltage source inverters and their control.	7

III	**DC Motor Drives** Methods of speed control, starting and braking operation, single phase and three phases full controlled and half controlled converter fed DC drives, Multi quadrant operation of separately excited DC shunt motor, dual converter fed DC drives, circulating and non – circulating mode of operation, converter fed DC series motor drive, chopper control of DC shunt and series motor drives, four quadrant operation of chopper fed DC shunt motor drive.	7

IV	**Induction Motor Drives** Torque equation, Speed control methods for three phase cage induction motor, braking methods, stator voltage control induction motor drive, VSI fed induction motor drive, constant torque (constant E/F and constant V/F), constant HP operation, closed loop speed control block diagram, Various methods of speed control for slip ring induction motors.	6
V	**Synchronous Motor Drives and Brushless DC Motor Drives** VSI fed synchronous motor drives, true synchronous and self-control mode, open loop and closed loop speed control of Permanent magnet synchronous machine, brushless DC motor drives.	6
VI	**Special Drives** Construction and operating principle of switched reluctance motors, Current / Voltage control, torque equation, converter circuits, operating modes and applications of switched reluctance motors. Solar panel VI characteristics, solar powered pump, maximum power point tracking and battery-operated vehicles.	6

Textbooks	
1	G. K. Dubey, *"Fundamentals of Electrical Drives"*, Narosa publication, 2nd edition, 2002.
References	
1	*"Fundamentals of Electrical Drives",* NPTEL video lecture series by Prof. Shyama Prasad Das, Department of Electrical Engineering, IIT Kanpur.
2	"*Power Electronics – Converter Application",* By N. Mohan T.M. Undel and W. P. Robbins, John Wiely and sons.
3	"*Electrical Drives – Concept and application*", Vedam Subramanyam.
Useful Links	
1	https://nptel.ac.in/courses/108/104/108104140/

CO-PO Mapping						
Programme Outcomes (PO)						
	1	2	3	4	5	6
CO1			3			
CO2				3		
CO3	3					
CO4				3		
The strength of mapping is to be written as 1: Low, 2: Medium, 3: Hi ¡h Each CO of the course must map to at least one PO.						

Assessment
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Syllabus Prepared By	Dr. D. S. More
Syllabus Checked By	

Walchand College of Engineering, Sangli

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AY 2024-25

Course Information	
Programme	M. Tech. (Electronics and Communication Engineering)
Class, Semester	First Year M. Tech., Sem.-II
Course Code	1OE508
Course Name	Introduction to Embedded Systems
Desired Requisites:	Computer Programming, Digital Electronics

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 3			

Course Objectives	
1	To introduce Embedded Systems and Programming.
2	To develop understanding about Microcontrollers
3	To introduce hardware components of Embedded Systems
4	To explain fundamentals of Arduino To explore Arduino based applications and programming

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	**Understand** Embedded Systems and Identify their applications	Understand
CO2	**Develop** knowledge about hardware and software of Embedded Systems	Apply
CO3	**Analyze** Arduino based systems and their programming	Analyze
CO4	**Develop** Arduino based systems applications	Create

Module	**Module Contents**	**Hours**
I	**Introduction to Embedded System** Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems Characteristics and Applications of embedded systems: operational and non-operational quality attributes. Embedded Systems Applications-Application specific – washing machine, domain specific - automotive	5
II	**Core of embedded systems** Microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components.	7
III	**Embedded Hardware** Memory map, i/o map, interrupt map, processor family, external peripherals, memory – RAM, ROM, types of RAM and ROM, memory testing, CRC, Flash memory. Peripherals**:** Control and Status Registers, Device Driver, Timer Driver - Watchdog Timers	7

IV	**Introduction to Arduino** Arduino device, Features of Arduino, Components of Arduino board, Description of Microcontrollers, Installation of Arduino IDE on Ubuntu Linux OS Run the Arduino executable file, Using IDE to prepare Arduino sketch, Uploading and running the sketch, Program notation: variables, functions, control flow, Arduino conventions. The concept of a program variable. Numerical values and basic numerical operators. if/then/else Iteration using for loops. Real world timing and the delay function	8
V	**Interfaces and Programming** Sensor Inputs: - Definition, Types. Interfacing Arduino to different sensors- light sensor, temperature sensor, humidity sensor, pressure sensor sound sensor, distance ranging sensor, water/detector sensor, smoke, gas, alcohol sensor, ultrasonic range finder, Displays: Basics of LED's and LCD's. Interfacing Arduino to LED's- blinking single LED, blinking multiple LED's, 7 segment display, traffic light, LED flashes, LED dot matrix, pulsating lamp. Interfacing to LCD's- Basic LCD control, LCD temperature control, display a message on LCD screen, scrolling of text Touch screens, Reading and writing to SD card	9
VI	**Arduino Applications** Case studies: Arduino based robot car, Arduino based PLC, industrial application	4

Textbooks	
1	Shibu K V , "Introduction to embedded systems", Tata McGraw-Hill, 1st edition
2	Brian Jepson, Michael Margolis, Nicholas Robert Weldin , "Arduino Cookbook", O'Reilly Media
3	Ashford Lee Edward, "Introduction to Embedded Systems", 2nd Ed. Paperback – 1 January 2019
4	

References	
1	Raj Kamal, "Embedded Systems: Architecture, Programming and Design" Tata McGraw-Hill
2	Michal Mc Roberts "Beginning Arduino" Second Edition, Technology in Action
3	Steve furber, "ARM System-on-Chip Architecture", Pearson Education
4	Frank Vahid and Tony Givargis, "Embedded System Design", Wiley

Useful Links	
1	https://nptel.ac.in/courses
2	https://www.coursera.org/
3	https://www.tutorialspoint.com/
4	https://www.arduino.cc/en/Tutorial/HomePage

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	2	3	4	5	6
CO1			2	2		
CO2			2	2		
CO3				2		2
CO4						1
Low, 2: Medium, 3: High						

Assessment
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Walchand College of Engineering, Sangli

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AY 2024-25

Course Information	
Programme	M.Tech. (Computer Science and Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	7OE509
Course Name	Machine Learning in practice
Desired Requisites:	Basic mathematics and python programming

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	3	30	20	50	100
		Credits: 3			

Course Objectives	
1	To introduce python and mathematical concepts required for machine learning
2	To prepare data for machine learning
3	To implement supervised and unsupervised learning algorithm

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	understand fundamentals of python libraries used for Machine Learning	II	Understanding
CO2	apply different data pre-processing techniques required for data preparation.	III	Appling
CO3	identify and implement different machine learning algorithms to solve real life problems.	IV	Analyzing
CO4	evaluate and compare performance of the machine learning algorithms.	V	Evaluating

Module	**Module Contents**	**Hours**
I	**Introduction to Machine Learning:** Introduction, Types of machine learning, Applications of Machine Learning, Python basics: basic constructs of python, pandas, NumPy, Matplotlib for data visualization	6
II	**Data pre-processing:** Data Cleaning: handling missing values, removing noise from data, handling categorical features, Feature selection and reduction, Data normalization, Train/test split, cross-validation	6
III	**Supervised Learning-I**: Linear regression, multiple regression, MSE, RMSE Classification using Naïve Bayes classifier, Decision tree classifier, KNN, logistic regression	8
IV	**Supervised Learning-II** Ensemble models: tree-based algorithms, Bagging, Boosting, Stacking. **Model Performance**: Confusion matrices, accuracy, precision, recall, F1 score, Hyper parameter tuning, deployment	8
V	**Unsupervised Learning:** Clustering- K means clustering, HDBSCAN, Dimensionality reduction using PCA.	5

VI	**Reinforcement learning and Case study** Introduction to reinforcement learning, Types, elements and applications of Reinforcement learning, Case studies based on various applications of machine learning algorithms in real life.	6
Textbooks		
1	Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.	
References		
1	Introduction to Machine Learning Edition 2, by Ethem Alpaydin.	
Useful Links		
1	https://www.geeksforgeeks.org/machine-learning/	
2	https://swayam.gov.in/nc_details/NPTEL	

CO-PO Mapping							
	Programme Outcomes (PO)						
	1	2	3	4	5	6	
CO1			1	1			
CO2			2	2	3		
CO3			2	2	3		
CO4			2	3	2		
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.							

Assessment

The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Open Elective

Walchand College of Engineering, Sangli
(Government Aided Autonomous Institute)

AY 2024-25

Course Information

Programme	M.Tech. (Data Science)
Class, Semester	First Year M. Tech., Sem II
Course Code	1OE510
Course Name	Data Science for Engineers
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	3 Hrs/Week	**ISE**	**MSE**	**ESE**	**Total**
Interaction	-	20	30	50	100
		Credits: 3			

Course Objectives

1	To get acquaint with concepts in Machine Learning (ML).
2	To apprehend the recent trends in Data Science
3	To make able to understand the applications in Data Science
4	To implement python code and add visualization using various libraries.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Understand the mathematical foundation required for data science.	II	Understanding
CO2	Apply the first level data science algorithms to solve problems.	II	Applying
CO3	Evaluate data science problem-solving algorithms and frameworks through a practical case study.	III/V	Analyzing /Evaluating
CO4	Construct several types of plots using various libraries of python.	VI	Creating

Module	**Module Contents**	**Hours**
I	**Basics of Python:** Tools required for Data Science, Introduction to Spyder, setting working directory, creating and saving a script file, file execution, clearing console, removing variables from environment, clearing environment, commenting script files, variable creation, arithmetic and logical operations, data types.	6
II	**Data types, Control structures and Libraries**: Strings, lists, arrays, tuples, dictionary sets, range, Reading files, exploratory data analysis, data preparation and preprocessing, If-else family, for loop, for loop with if break, while loop and functions, Numpy, Pandas	7

III	**Data Visualization** : Data Visualization using Matplotlib and Seaborn libraries.Scatter plot, line plot, bar plot, histogram, box plot, pie chart, pair plot	6
IV	**Unsupervised Learning:** Why data reduction?, key idea behind PCA, linear algebra behind PCA, PCA in practice, clustering algorithm in practice, case study of k-means algorithm	6
V	**Interactive Python dashboards with Plotly :** Ploty Basic - scatter plot, bar plot, bubble plot, box plot, histograms, heat maps, dashboard components, interactive components in dashboard	7
VI	**Case Studies:** Regression and Classification (Use of any case study using a dataset),Regression Datasets : Crime_in_India, Salary_Classification, Income_Data, Classification Datasets - Shopping_Mall, Social_Network_Ads	7

Textbooks	
1	R. Nageswara Rao, ―‖Core Python Programming‖,‖ Dreamtech Press, 2nd Edition, 2017
2	Chun, J Wesley, ―‖Core Python Programming‖‖, Pearson, 2nd Edition, 2007 Reprint 2010
3	Douglas Montgomery- ―Applied statistics and probability for engineers‖, Wily, Pearson, 6th Edition, 2016
5	Samir Madhavan -Mastering Python for data science- PACKT,1st edition 2015

References	
1	Scikit-Learn User Guide, Release 0.23.1, scikitlearn developers, May 19,2020
2	Python 3.x Documentation
3	Gilbert Strang- Introduction to linear algebra ,Pearson, 6th Edition, 2017

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc19_mg47/preview
2	https://docs.python.org/3/tutorial/
3	https://www.learnpython.org/
4	https://www.hackerrank.com/

CO-PO Mapping

	Programme Outcomes (PO)					
	1	2	3	4	5	6
CO1		2				
CO2	2		1			
CO3		1	3			1
CO4		2	1			

T e strength of mapping is to be written as 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO.

Assessment
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information

Programme	M.Tech. Open Elective (Other than M.Tech. Construction Management and Environmental Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	1OE511
Course Name	Project Management
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	-				
Interaction	3 Hrs/week	**Credits: 3**			

Course Objectives

1	Provide students with a solid foundation in project management theories and techniques.
2	Enable students to apply project management methodologies to real-world project scenarios, critical thinking and problem-solving skills.
3	Provide students essential project communication, leadership, and teamwork skills necessary for their roles as effective professionals.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Apply the project management techniques including plans, activity schedules, finance and managing project uncertainties.	Applying
CO2	Construct project plans by using work breakdown structures, critical path analysis for projects, ensuring real-time applicable resource allocation and time management.	Creating
CO3	Apply quality management and control methods for effective progress, identify conflicts, implement remedial actions and enhance professional communication skills to ensure successful project delivery.	Applying

Module	**Module Contents**	**Hours**
I	**Concepts of Project Management** Definition of Project, Definition and Concept of Project management, Processes involved in Project Management, Project life cycle and phases, Stakeholders for project and respective roles, Project success criteria.	6
II	**Project Initiation and Activity Planning** Project selection criteria, defining necessities of a project, Work Breakdown Structures (WBS), Sequencing Activities, Probability criteria involved in project, Network and Non Network scheduling concept	7
III	**Project Schedule Management** Schedule Calculation, Critical Path Method (CPM) and Program Evaluation and Review Techniques (PERT) concept, Continual updating of schedule, Resource allocation, Resource levelling, Network compression techniques, schedule controlling, Resource smoothening,	7
IV	**Project Cost and Budget Management** Project cost management concept, Budgeting, Hierarchical activity based costing, Estimation methods for cost calculation, Types of costs involved in s project, Budget developing and monitoring, Concepts of Cost Performance Index (CPI), Earned Value (EV), Planned Value (PV), schedule performance index (SPI), variance analysis and Cost control, Taxation.	7

V	**Leadership, Communication and Team Management** Leadership in project management, Communication planning, Stakeholders communication, Meetings, Organization culture in project management, Developing project teams, SWOC/SWOT analysis, Addressing and Resolving Conflicts, Ethics	7
VI	**Project Quality Management and Documentation** Project Quality Management concept and implementation, Handover and closer of a project, Presentation, Report writing and documentation, Continual Review system from pre to post phases of projects.	6

	Text Books
1	Nagarajan, K., Project Management: Project Appraisers. Project Mangers Entrapreneurs, Acadaemics & Case Studies, New Delhi New Age International (p) Ltd., 6th edition 2014
2	Richardson, G.L, Project Management : Theory and Practice, Florida CRC Press, 1st Edition 2011
3	Maley, C.H., Project Management Concepts, Methods and Techniques, Florida CRC Press, 1st edition, 2012
	References
1	Grundy, T. & Brown, L., Strategic Project Management, Thom publication, 1st edition, 2003
2	Garton, C., Fundamentals of Technology Project Management, Navi Mumbai Shroff Publishers and Distributors Pvt. Ltd., 1st Edition, 2004s
3	Gopalkrishnan.P. & Ramamoorthy.V.E., Textbook Of Project Management., Macmillan India Ltd., 2nd edition 1996
	Useful Links
1	https://nptel.ac.in/courses/110107081

CO-PO Mapping						
COs	**Programme Outcomes (PO)**					
	1	2	3	4	5	6
CO1	3				1	2
CO2			2	2		3
CO3		2			2	
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High						

Assessment
ISE: ISE shall be taken throughout the semester in the form of a teacher's assessment. Mode of assessment can be field visits, assignments, etc., and is expected to map at least one higher-order PO. MSE: Assessment is based on 50% of course content (Normally first three modules) ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing).

Walchand College of Engineering, Sangli

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AY 2024-25

Course Information	
Programme	M.Tech. (all branches)
Class, Semester	First Year M. Tech., Sem II
Course Code	1OE1515
Course Name	Biotechnology for Engineers
Desired Requisites:	Basic biology knowledge at Secondary level

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	0 Hrs/week	30	20	50	100
		Credits: 3			

Course Objectives	
1	Provide foundation in basic biology principles and knowledge
2	Have an overview of biological sciences and engineering and should be aware of current developments in biochemistry and allied subjects.
3	Exposure to various research fields and thrust areas in biotechnology.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Students will understand fundamental concepts in core areas of biotechnology, such as molecular biology, genetics, and plant and animal biotechnology.	I	Remembering
CO2	Students learn about the principles and applications of microscopy, the structure and characteristics of microorganisms, and the immune system. They also learn about cell biology, the regulation of the cell cycle, and biomolecules.	II	Understanding
CO3	Students will be able to use their knowledge to solve problems in a variety of settings, including industry, government, and entrepreneurship.	III	Applying

Module	**Module Contents**	**Hours**
I	**Understanding Basics of Biology:** a) Biomolecues: water, vitamins and minerals, biopolymers-cabohydrates, lipids, proteins, nucleicacids (DNA and RNA) b) Organization of life: Cells (prokarypotic, eukaryotic, plantand animals) structure and function of cell organelles, tissues, organs, organ systems and organism	7
II	**Bioenergetics:** a) Metabolism: thermodynamics of biology b) energy dynamics with respect to chloroplast (photosynthesis) and mitochondria (respiration)	6

III	**Transport and communication:** a) In plants: xylem and phloem; in animals: blood andlymph. transport of gases, cell-cell communication Defence mechanism in plants and animals. Immunological concepts- antigen, antibody, humoral and cell mediated immune system, cells and organs of immune system, vaccines.	7
IV	**Techniques and devices:** a) introduction to Recombinant DNA Technology, Monoclonal antibodies, fermentation technology, plantand animal tissue culture Techniques and instruments of analysis- microscope, centrifuge, electrophoresis, chromatography, tracer techniques and biomedical instruments.	7
V	**Trends in Bioengineering:** a) Introduction to Microbiology and nanotechnology: diagnostics and therapeutics, Biocomputing, bioinstrumentation, bioimaging and biosensors Biomimatics: nature inspired designs and processes	6
VI	**Future scope and ethics:** a) Future of biotechnology associated with engineers- medical, agricultural and environmental perspectives Ethics in bioengineering.	6

References	
1	P. S. Verma and V. K. Agrawal, Concept of cell biology S. Chand and Co. Ltd 2002
2	T. S. Ranganathan, Textbook of Human Anatomy, S. Chand and Co. Ltd 2004
3	V. Sree Krishna, comprehensive biotechnology I- cell biology and genetics, New age, 2005
4	
5	

CO-PO Mapping

	Programme Outcomes (PO)												**PSO**	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3													
CO2	3													
CO3	3													
CO4	3													

The strength of mapping is to be written as 1: Low, 2: Medium, 3: High

Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.
MSE shall be typically on modules 1 to 3.
ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments, surprise or declared test etc.
ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.
For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)