Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26 onwards

Course Information

Programme	B. Tech. (Civil Engineering)
Class, Semester	Third-Year B. Tech., Sem. V
Course Code	7MDCV301
Course Name	Waste Management and Pollution Control
Desired Requisites:	Water Supply and Treatment Technology, Environmental Science

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

Course Objectives

1	To introduce concepts of wastewater engineering, solid waste processing, air and noise pollution control.
2	To provide pertinent knowledge for the design and operation of waste management facilities.
3	To prepare students for higher studies and research in the field of waste management and pollution control.
4	To make students aware of recent advances in waste management.

Course Outcomes (CO)

CO	Description	Blooms Taxonomy	
		Descriptor	Level
CO1	**Explain** collection and characteristics of wastewater and solid waste; monitoring air quality and meteorological impact; treatment/processing/control technologies for prevention of pollution associated with wastewater, solid waste, air and noise.	Understand	II
CO2	**Apply** the waste management concepts	Apply	III
CO3	**Analyze** the problems on wastewater and solid waste associated with generation, characteristics, collection and treatment/processing; air and noise pollution.	Analyze	IV
CO4	**Design** sewerage and wastewater treatment system.	Design	VI

Module	**Module Contents**	**Hours**

I	**Wastewater and Collection** Wastewater: Sources, Flow rate and variations, Quantitative estimation, Characteristics Gravity sewer collection system: Nomenclature, Manhole, Pumping station Introduction to pneumatic (vacuum drainage) sewer system Design of sanitary and storm sewer, Computer application SEWERCAD	**6 L**
II	**Introduction to Wastewater treatment** Wastewater treatment: Philosophy, Unit operations and unit processes Primary treatment: Screening, Grit removal, Settling Biological/Secondary treatment: Fundamentals of aerobic and anaerobic treatment, Classification	**5 L**
III	**Aerobic Wastewater treatment** Aerobic suspended growth: Conventional Activated Sludge Process (ASP), Sequential batch reactor (SBR), Process design and operating parameters (ASP and SBR), Operational problems (ASP), Concepts of oxidation ditch and Waste stabilization pond Biological filtration	**10 L**
IV	**Decentralized treatment and Disposal** Decentralized treatment: Concept, Septic tank and soakage pit, Anaerobic baffled reactor (ABR), Anaerobic filter (AF), Constructed wetland (CW), Typical system Advances in wastewater treatment : Moving bed bioreactor (MBBR), Membrane bioreactor (MBR) Concept of package sewage treatment plant Disposal of wastewater: Methods, Effluent standards Stream pollution: Self-purification (Stream rejuvenation), DO sag curve, Streeter Phelp's equation for point source, Stream classification	**7 L**
V	**Solid waste** Sludge: Characteristics, thickening, dewatering, digestion, disposal Solid Waste: Characteristics, Generation, Collection and transportation Engineered systems for solid waste processing: Mechanical, Thermal, Biological Sanitary land fill: Location, Components, Design, Bio-mining	**6 L**

VI	**Air and Noise pollution** Air Pollution: Meteorological parameters, Ambient air quality monitoring, Indoor air pollution, Air quality standards Air pollution control: Approaches and equipment for particulate and gaseous pollutants Noise pollution: Permissible limits of noise pollution, measurement of noise, Control of noise pollution.	**6 L**

Text Books	
1	Nathanson, J. A., "Basic Environmental Technology", PHI Learning private limited, 5th Edition, 2009.
2	Modi, P. N., "Wastewater Engineering" Standard Book House, 6th Edition, 2018.
3	Peavy H, S, Rowe D, R, and Tchobanoglous G, "Environmental Engineering", McGraw-Hill Book Company, Indian Edition, 2017.

References	
1	Hammer M, J and Hammer M, J, "Water and Wastewater Technology", PHI learning private limited, 7th Edition, 2018.
2	"Manual on Sewerage and Sewage Treatment", CPHEEO, Ministry of Housing and Urban Affairs Development, Govt., of India, New Delhi, 2013.
3	"Manual on Municipal Solid Waste Management", CPHEEO, Ministry of Housing and Urban Affairs Development, Govt., of India, New Delhi, 2016.

Useful Links	
1	https://nptel.ac.in/course.html

CO-PO Mapping

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

The strength of mapping: - 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 a teacher's assessment. The mode of assessment can be field visits, assignments, etc., and is expected to map at least one higher-order PO. ESE shall be on all modules with around 25-30% weightage on modules 1 to 3 and 70-75% 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)

Prepared by	DAC/BoS Secretary	Head/BoS Chairman

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26 onwards

Course Information

Programme	BTech (Civil Engineering)
Class, Semester	Third Year Sem VI
Course Code	7MDCV321
Course Name	Infrastructure Planning and Development
Desired Requisites:	NIL

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	4 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
Practical	-				
Interaction	-	**Credits: 4**			

Course Objectives

1	To study the necessity of infrastructure & its management
2	To evaluate and managerial economics of infrastructure projects.
3	To analyse and design the efficient infrastructure projects.

Course Outcomes (CO)

CO	Description	Blooms Taxonomy	
		Descriptor	Level
CO1	Achieve Knowledge of Planning and development of problem-solving skills in management.	Understanding	2
CO2	Understand the principles of financial fundamentals.	Understanding	2
CO3	Evaluate the concepts of financial and Economics management.	Evaluating	4
CO4	Assess the risk involved in infrastructure projects.	Applying	3

Module	**Module Contents**	**Hours**
I	**Basics of Infrastructure** Understanding of Infrastructure, Types of Infrastructure, Role of Infrastructure, Infrastructure scenarios in India and problems of Infrastructure Development in India. An overview of Urban Infrastructure in India, Models of Urban Governance, Municipal Finances, Major municipal reforms, Framework for Urban Infrastructure Delivery, Quality of water supply and services, Models of Urban governance, Municipal governance, Urban renewal projects.	9
II	**Rural Infrastructure in India** Road development scenario in India, the state of rural infrastructure in India, Infrastructure and rural growth, Characteristics of rural India, Strategies to improve infrastructure in rural areas, Government initiatives for rural infrastructure improvement, Role of private sector in infrastructure development.	8
III	**Key Issues of provision of Infrastructure system** Leadership and strategy issues in the funding, financing, development and delivery of new infrastructure in the country Issues regarding the design and technology to be used, priority of location of infrastructure development, cost and level of risks that we have to tolerate.	9
IV	**Infrastructure Investment and Finance** Background behind investment and funding required for the financial planning of the infrastructure Various forms of funding available for infrastructure (public, private and combined), Cost- benefit analysis Stages of an infrastructure project Lifecycle.	9

V	**Privatization in Infrastructure Projects** Overview of history of privatization, The Benefits of Infrastructure Privatization, Problems with Infrastructure Privatization, Privatization of road Transportation Infrastructure in India	8
VI	**Risk and Risk management framework for infrastructure project implementation** Legal contractual Issues in Infrastructure Projects, Environmental issues in infrastructure development, Challenges in Construction and Maintenance of Infrastructure, case studies.	9

Text Books	
1	Goodman AS, Hastak M (2006). Infrastructure Planning Handbook: Planning, Engineering, and Economics. McGraw Hill/ ASCE Press
2	Proag, V. (2020). Infrastructure Planning and Management: An Integrated Approach. Germany: Springer International Publishing.
References	
1	Elmer, Vicki, and Leigland, Adam. Infrastructure Planning and Finance: A Smart and Sustainable Guide. United Kingdom, Taylor & Francis, 2013.
2	Routledge Handbook of Planning and Management of Global Strategic Infrastructure Projects. (2020). United Kingdom: CRC Press.
Useful Links	
1	https://www.youtube.com/watch?v=bxNSXutf3N4&list=PLFGUksPYY9Qp5rLjedeUIwcu13eAeETkh

CO-PO Mapping

	Programme Outcomes (PO)												PSPO	
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2										3			
CO2	2										3			
CO3						1					3			
CO4				3							3			
CO5														
CO6														

The strength of mapping: - 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 a teacher's assessment. The mode of assessment can be field visits, assignments, etc., and is expected to map at least one higher-order PO.

ESE shall be on all modules with around 25-30% weightage on modules 1 to 3 and 70-75% 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 2025-26

Course Information

Programme	B.Tech. (Mechanical Engineering)
Class, Semester	Third Year, SEM V-MDM
Course Code	7MDME301
Course Name	Manufacturing Systems
Desired Requisites:	Basic Workshop Practice, EME,

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

Course Objectives

1	To provide a foundational understanding of manufacturing systems and processes including conventional and non- conventional manufacturing techniques.
2	To introduce the use of computer-aided tools in design and manufacturing.
3	To familiarize students with modern manufacturing technologies such as CNC and additive manufacturing.

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 basic manufacturing processes.	I	Understanding
CO2	Classify the conventional and non- conventional manufacturing processes.	II	Classify
CO3	Explain the working principles, advantages, and limitations of metal forming, shaping processes.	II	Remembering
CO4	Apply the knowledge of modern manufacturing processes for various engineering applications.	III	Applying

Module	**Module Contents**	**Hours**
I	**Basics of Manufacturing Systems:** Definition of Manufacturing System, types- job shop manufacturing, batch manufacturing, mass manufacturing, continuous manufacturing and additive manufacturing, its applications.	6
II	**Metal Forming Processes:** a. Rolling – Introduction, Hot and cold Rolling, Classification of Rolling Mills, Defects in Rolling, b. Forging- Introduction, Hand Forging Operations, Forging Machines (board Hammer, Air and Steam, Hydraulic Hammer) Open and Closed Die Forging, Defects in Forging. c. Extrusion- Introduction, Types – Direct, Indirect, Tube, Impact and Hydraulic Extrusion, Defects in Extrusion	7

III	**Metal Shaping Processes:** a. Plastics Processing: Types and characteristics of plastics, Molding of thermoplastics – working principles and typical applications, injection molding, Plunger and screw machines, Compression molding. b. Sheet metal working: Sheet metal cutting operations, sheet metal noncutting operations.	7
IV	**Non-Conventional Machining Processes:** Need Classification, selection of process, Electro Discharge Machining, Electro Chemical Machining, Ultra Sonic Machining, Electron Beam Machining, Laser Beam Machining, Plasma Arc machining, Abrasive Jet Machining, Water Jet Machining, Abrasive water jet machining	7
V	**Background of Manufacturing Systems and Its Support Systems:** Computer applications in Design and manufacture, Introduction to Design Process / Materials, Computer aided manufacturing, Integration of CAD/CAM/CAE in Digital Manufacturing.	6
VI	**Modern Manufacturing:** CNC, CNC vs Manual machining, parts, CNC Programming Basics, G-codes and M-codes, Coordinate systems (absolute vs incremental), Applications of CNC. VMC, basic parts, applications. Additive Manufacturing (3D Printing), Types of 3D Printing Technologies, Workflow of 3D Printing, applications.	7

Text Books	
1	A Textbook of Production Technology (Manufacturing Processes), P.C. Sharma, S. Chand publications.
2	Production Technology by R.K. Jain, Khanna publications.
3	Fundamentals of Modern Manufacturing: Materials, Processes, and Systems by Mikell P. Groover, Wiley publications.
4	CAD/CAM: Principles and Applications by P.N. Rao, Tata McGraw Hill publications.

References	
1	Manufacturing Engineering and Technology by Serope Kalpakjian & Steven R. Schmid, Pearson Education
2	NC Technology and Programming by Krar, Gill & Smid, Delmar Cengage publications
3	Automation, Production Systems, and Computer-Integrated Manufacturing by Mikell P. Groover.

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc22_me28
2	https://www.youtube.com/watch?v=2vFdwz4U1VQ
3	https://nptel.ac.in/courses/112/103/112103306

CO-PO Mapping for Mechanical Engineering Department															
	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1	1				2							1			
CO2		2			2										
CO3	1	2													
CO4		3			2							2			

The strength of mapping is to be written as 1,2,3; Where, 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 *(Government Aided Autonomous Institute)*					
AY 2025-26					
Course Information					
Programme	B. Tech. (Mechanical Engineering)				
Class, Semester	Third Year B. Tech., SEM-VI				
Course Code	7MDME321				
Course Name	Thermal Engineering				
Desired Requisites:	Basic Mathematics, Chemistry				
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 3			

Course Objectives	
1	Students will get Knowledge of basic concepts of thermal engineering, fluid mechanics, heat transfer and its applications.
2	Student will be aware about advanced concepts in thermal engineering subject to analysis of thermal systems and its environmental implications and sustainability
3	Student will be acquire the confidence in analyse the motion of combusting and no combusting fluids whilst accounting for variable specific heats, non-ideal gas properties, chemical no equilibrium and compressibility

Course Outcomes (CO)

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	Explain the concepts of thermodynamics, fluid mechanics and heat transfer	II	Understanding
CO2	Apply the concepts of Thermodynamics and heat transfer in the heat management of robotics system, batteries, building and electronic components.	III	Applying
CO3	Analyse the combustion mechanisms of various fuels.	IV	Analysing
CO4	Evaluate the performance of various thermal systems	V	Evaluating

Module	Module Contents	Hours
I	**Introduction to Thermal Engineering** **Basic Concepts** Thermodynamics and Energy, Systems and Control Volumes, Properties of a System, State and Equilibrium, Processes and Cycles, Temperature and the Zeroth Law of Thermodynamics. **Energy** Forms of Energy, Energy Transfer by Heat and Work, The First Law of Thermodynamics, Energy Conversion Efficiencies, Energy and Environment **Practical Applications** Relevance of thermodynamics in energy systems, HVAC, cooling in electronics, and automation.	6
II	**Heat Transfer and Thermal Management Techniques** **Modes of Heat Transfer**: Conduction, convection, and radiation.	6

	Thermal Management in Electronics: Active/passive cooling methods for microelectronics. Heat Management in actuators, sensors, and motors. **Applications**: Thermal management for smart buildings (HVAC), power plants, battery pack.	

III	**Fluid Mechanics and Thermal Systems** Distinction between solids and fluids, ideal vs. real fluids. Density, viscosity, surface tension, compressibility, specific volume, and specific weight. Bernoulli's equation, Reynolds number, and flow regimes (laminar and turbulent). Computational Fluid Dynamics **Heat Transfer in Fluids**: Flow in pipes, ducts, and heat exchangers (shell-and-tube, plate heat exchangers). Thermal boundary layers and heat transfer enhancement techniques (e.g., microchannels, nanofluids).	6
IV	**Power Generation and Refrigeration Systems** **Thermal Power Generation**: Basics of thermal power plants (Rankine cycle), Gas turbines and Brayton cycle, Combined heat and power (CHP) systems **Renewable Energy Systems: Solar** thermal and photovoltaic systems, Wind power and geothermal systems, Bioenergy and waste-to-energy systems **Refrigeration System :** **Basic principles** of refrigeration: heat transfer, thermodynamic cycles (vapor-compression, absorption, and others), Refrigeration cycle analysis, Coefficient of Performance (COP)., Heat Pump, Air Conditioning	6
V	**Combustion and Fuel Technologies** **Combustion Fundamentals**: Combustion reactions and stoichiometry, Adiabatic flame temperature and combustion efficiency, Types of combustion (Complete vs. incomplete) **Fuels and Emissions**: Types of fuels: Solid, liquid, gas, biofuels, Characteristics of fuels (heating value, combustion temperature), Pollutants in combustion (NOx, CO, SOx, particulate matter), Emission control and technologies	6
VI	**Environmental Impact and Sustainability in Thermal Engineering** Greenhouse gas emissions and thermal engineering solutions, Low-GWP refrigerants and environmentally-friendly energy systems, Thermal pollution and its control, Sustainable thermal management in buildings and industries	6

Text Books	
1	An Introduction to Thermodynamics, Y.V.C. Rao, University Press (India) Private Limited, Revised Edition, 2004).
2	Thermodynamics: an Engineering Approach, Y.A.Cengal and M.A.Boles, McGraw Hill (Fifth edition).
3	Fundamentals of Classical Thermodynamics, G.VanWylen, R.Sonntag and C.Borgnakke , John Willey & Sons (Fourth edition).
References	
1	Cengel, "Thermodynamics", Tata McGraw Hill Co., New Delhi, 1980.
2	Howell and Dedcius, "Fundamentals of Engineering Thermodynamics", McGraw Hill Inc., U.S.A
3	Van Wylen& Sonntag, "Thermodynamics", John Wiley and Sons Inc., U.S.A
4	Jones and Hawkings, "Engineering Thermodynamics", John Wiley and Sons Inc., U.S.A, 2004.
5	Holman, "Thermodynamics", McGraw Hill Inc., New York, 2002.
6	Faires V.M. and Simmang, "Thermodynamics", Macmillan Publishing Co. Inc., U.S.A.
7	Rao Y.V.C., "Postulational and Statistical Thermodynamics", Allied Publishers Inc, 1994
Useful Links	
1	https://youtu.be/lvy8h-yWhRQ
2	https://youtu.be/JIDK5iyatBk

3	https://youtu.be/EYKeBg4DmHI

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 2025-26

Course Information	
Programme	B. Tech. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem. VI
Course Code	7MDME371
Course Name	Mechanical Systems Lab
Desired Requisites:	

Teaching Scheme		Examination Scheme (Marks)			
Lecture	3 Hr/week	**LA1**	**LA2**	**Lab ESE**	**Total**
Tutorial	--	30	30	40	100
		Credits: 1			

Course Objectives

1	To analyze and verify the motion characteristics and kinematic parameters of various mechanisms, including Hooke's joint and gear trains.
2	To develop computational tools and techniques for velocity and acceleration analysis of common planar mechanisms like four-bar chains and slider-crank mechanisms.
3	To understand and determine advanced dynamic concepts such as Coriolis acceleration and moment of inertia using experimental and analytical methods.
4	To study and apply gear design principles, including involute profile generation and analysis of epicyclic gear trains and automobile gearboxes.

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	**Analyze** the motion characteristics of Hooke's joint and various mechanisms using fundamental kinematic principles.	4	Analyze
CO2	**Develop** computer programs for velocity and acceleration analysis of four-bar chain and slider-crank mechanisms.	3	Develop
CO3	**Determine** Coriolis component of acceleration and moment of inertia using experimental methods.	5	Evaluate
CO4	**Construct** and **evaluate** gear profiles and gear trains, including epicyclic and automobile gearboxes.	5	Evaluate

List of Experiments

1. To verify angular displacement ratio of shaft connected by Hooke's joint
2. To find out the Coriolis component of acceleration.
3. To develop a computer program for velocity and acceleration analysis of four bar chain and single slider crank mechanism.
4. To generate involute gear tooth profile.
5. To solve problems on the epicyclic gear train by the tabular method.
6. To determine M.I. by Bi-filler suspension, Tri-filler suspension, or compound pendulum method.
7. To study different mechanisms and analyse them for links, joints, DoF etc
8. To analyses gear trains in the lathe machine, the drilling machine, milling machine.
9. To study automobile gearboxes

References	
1	Thomas Bevan, *"Theory of Machines",* CBS Publishers, New Delhi, 1st Edition, 2010.
2	J. F. Shigley,*"Mechanical Engineering Design",* , McGraw Hill, New York. 4th Edition, 2011

Useful Links	
1	
2	

Textbooks	
1	Ratan S.S, *"Theory of Machines"*, Tata McGraw Hill, New Delhi, 3rd Edition, 2011
2	V. B. Bhandari, "*Design of Machine Elements",* Tata McGraw Hill, 3rd Edition, 2011
3	Sadhu Singh,*"Theory of Machines",* Pearson Education, 2nd Edition, 2009

CO-PO Mapping

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

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

There are three components of lab assessment, LA1, LA2 and Lab ESE.

IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 5 Marks Submission at the end of Week 5	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 6 to Week 9 Marks Submission at the end of Week 9	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 10 to Week 12 Marks Submission at the end of Week 12	40

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per

the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

Walchand College of Engineering, Sangli

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AY 2025-26

Course Information	
Programme	B. Tech. (Electrical Engineering)
Class, Semester	Third Year B. Tech., Sem. V (MDM Course)
Course Code	7MDEL301
Course Name	Power System Engineering
Desired Requisites:	NIL

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

Course Objectives

1	To understand electrical power generation.
2	To understand transmission and distribution system.
3	To understand protection system with different element.
4	To Explain smart grid technology and trends in power system.

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 the electrical power generation by convention and non-convention sources.	II	Understanding
CO2	Explain different methods of transmission and distribution system with components used for power transmission.	II	Understanding
CO3	Describe protection system with different element used in power system for protection of power system.	II	Understanding
CO4	Illustrate smart grid technology and trends in power system for modernisation of power grid.	III	Applying

Module	**Module Contents**	**Hours**
I	**Non-Renewable Energy Sources** Indian electricity scenario of non-renewable energy sources, overview of Indian national grid, single line diagram of electrical power system, types of non-renewable energy sources, schematic diagram, working, advantages and disadvantages of thermal power plant, hydro power plant	7
II	**Renewable Energy Sources** Indian electricity scenario of renewable energy sources, need for renewable energy, advantages and disadvantages of renewable energy, types of renewable energy sources, schematic diagram, working, advantages and disadvantages of solar and wind power plant	7
III	**Overhead Transmission System** Types of transmission system (short, medium and long), types of transmission line conductor (ACSR, expanded ACSR and ACAR), line supports and types of insulators, **Substation:** outdoor substation, indoor substation	6
IV	**Distribution System and UG Cables** Distribution system, classification of distribution feeders, connection scheme and operation of distribution system. **Underground cables:** construction and classification of cables, methods of laying underground cables.	6

V	**Protection and Power System Elements** Different types of fault, relay and circuit breaker, MCB, rewireable and HRC fuse, fuse characteristics, application and selection of fuse. **Power system elements:** brief description of power system element such as generator, transformer, bus bar, isolator, CT, PT and LA.	7
VI	**Smart Grid and Trends in Power System** introduction to smart grid in Indian context, architecture of smart grid, advantages and disadvantages, key challenges for smart grid, smart grid technologies, standards and codes for grid integration of dg systems. **Trends in Power System:** introduction to wireless power transmission system.	6

Textbooks	
1	Principles of Power System, V. K. Mehta & Rohit Mehta, S. Chand Publication, 4th Edition.
2	Electrical Power Generation, Transmission and Distribution, S. N. Singh, PHI Publication, 2nd Edition
3	Power System Protection and Switchgear, Badri Ram, Tata McGraw, 9th Edition.

References	
1	Electrical Power System, C. L, Wadhwa, New Age Int. Publication, 6th Edition.
2	Generation of Electrical Energy, B. R. Gupta, S. Chand Publication, 5th Edition.
3	Switchgear Protection, J. B. Gupta, S. k. Kataria & Sons., 2nd Edition.

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc25_ee67/preview

CO-PO Mapping

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

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 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. Swapnil D. Patil
Syllabus Checked By	Mr. M. S. Mahagaonkar

Walchand College of Engineering, Sangli

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AY 2025-26

Course Information	
Programme	B. Tech. (Electrical Engineering)
Class, Semester	Third Year B. Tech., Sem. VI (MDM Course)
Course Code	7MDEL321
Course Name	Power Electronics and Drives
Desired Requisites:	Fundamentals of Electrical Engineering

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

Course Objectives	
1	To provide basic knowledge of different power electronic devices, rectifiers, converters, inverters and choppers.
2	To impart skills to control different types of converters such as rectifiers, controlled converters, inverters and choppers.
3	To understand the fundamentals of electrical drives.
4	To strengthen control principles of various DC and AC motors using solid state converters.

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 the basics of semiconductor switches, rectifier, controlled converter, inverter, choppers,	I	Remember
CO2	Explain the applications of rectifier, controlled converter, inverter, choppers,	II	Understand
CO3	Explain the various concepts used in electric drives.	II	Understand
CO4	Apply the control techniques for electric drives for speed control.	III	Apply

Module	**Module Contents**	**Hours**
I	**Power Semiconductor Switches and DC to DC Converters** Introduction to semiconductor switches such as Power diode, thyristor, MOSFET, IGBT and GTO. V-I characteristics, turn -on and turn- off and comparison between them and their applications. DC to DC converters, buck, boost and buck-boost converter, two quadrant and four quadrant chopper, (only circuit operation and output voltage control) applications of DC to DC converter	7
II	**AC to DC Converters (Uncontrolled and Controlled)** Single phase full wave diode bridge and single phase full wave full controlled AC to DC thyristor converter, three phase full wave diode bridge and three phase full wave full controlled and semi controlled thyristorised converter. (operation and output voltage control.)	6
III	**Single phase and three phase Inverters** Basic concepts of switch mode inverters, types: VSI and CSI, single phase half bridge and full bridge inverter, three phase six step inverter, 120 degree mode of conduction, 180 degree mode of conduction, three phase PWM Inverter, sinusoidal PWM technique, output voltage and frequency control	7

IV	**Fundamentals of Electrical Drives** Introduction to electric drives and classifications, advantages and applications of electric drives, components of drive systems, four-quadrant operation of drives, speed-torque characteristics of: DC shunt motor, separately excited DC motor, induction motor (squirrel cage and slip-ring)	6
V	**Control of DC 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
VI	**Control of AC 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,. Speed control of BLDC and PMSM	6

Textbooks	
1	P. S. Bhimra, "Power Electronics",3rd Edition, Khanna Publishers, 2002.
2	Dubey, G. K. Fundamentals of Electrical Drives. 2nd ed., Narosa Publishing House, 2002. ISBN-13: 978-8173194283.
References	
1	M. H. Rashid "Power Electronics, Circuits, Devices and Applications", Pearson Education Inc., 4th Edition, November 2017.
2	Subrahmanyam, Vedam. Electric Drives: Concepts and Applications. 1st ed., Tata McGraw-Hill Publishing Company, 2001. ISBN: 978-0074603703.
Useful Links	
1	https://nptel.ac.in/courses/108/104/108104140/

CO-PO Mapping

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

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 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	Seema P Diwan
Syllabus Checked By	Dr. D S More

Walchand College of Engineering, Sangli

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Course Information

Programme	B. Tech. (Electrical Engineering)
Class, Semester	Third Year B. Tech., Sem. VI (MDM Course)
Course Code	7MDEL371
Course Name	Power Electronics and Drives Lab
Desired Requisites:	Basic Electrical and Electronics Engineering

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	-	30	30	40	100
		Credits: 1			

Course Objectives

1	This course intends to provide the practical knowledge of different power electronics devices.
2	It is aimed to impart skills of working of different power electronic converter through simulation and experimentation.
3	Make the students acquainted with simulation, analysis and design of power electronic converters.
4	To provide the practical knowledge of different power electronics 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	To Analyse the performance of single phase half wave and full wave converters	IV	Analysing
CO2	To Analyse the performance of three phase half wave and full wave converters	IV	Analysing
CO3	Construct different types of converters such as rectifier, inverter and Chopper with their control techniques using simulation.	IV	Analysing
CO4	Measure the performance of Electrical drives.	V	Applying

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Analyze the performance of DC motor FED from single phase full wave half control converter.
2. Analyze the performance of DC motor FED from single phase full wave full control converter.
3. Study the operation of two quadrant single phase converter fed 5 HP DC drive (Simulation).
4. Analyze the performance of three phase full wave half control converter.
5. Analyze the performance of three phase full wave full control converter.
6. Analyse the performance of chopper fed D. C. drive for closed – loop speed control (simulation).
7. Open loop speed control of three inductions motor supplied from three phase PWM inverter.
8. Simulation of PWM inverter FED induction motor drive.
9. Simulation of BLDC motor drive.
10. Simulation of PMSM drive.

Textbooks

1	M.H.Rashid "Power Electronics, Circuits, Devices and Applications", Pearson Education Inc., 4th Edition, November 2017.
2	P. S. Bhimra, "Power Electronics",3rd Edition, Khanna Publishers, 2002.

References

1	B.K. Bose, "Modern Power Electronics and A.C. Drives", Prentice Hall of India Pvt. Ltd. Publication, 2002.

2	Mohan, Undeland and Robins, "Power Electronics, Converter Applications and Design", John Wiley and sons (Asia) Pvt. Ltd., 3rd Edition, 2010.
3	G. K. Dubey and Others "Thyristorised Power Controller", New Edge International Publishers, 1st Edition Reprint, 2005.
Useful Links	
1	https://nptel.ac.in/courses/108/104/108104140/

CO-PO Mapping

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

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

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

Syllabus Prepared By	Seema P Diwan
Syllabus Checked By	Dr. D S More

Walchand College of Engineering, Sangli

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AY 2024-25

Course Information

Programme	Multidisciplinary Minor (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem.-II
Course Code	7MDEN221
Course Name	Electronic Devices and Circuits
Desired Requisites:	Basic Electrical and Electronics Engineering

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

Course Objectives

1	To **explain** the working of diode circuits and electronic circuits like small signal amplifiers, power amplifiers using BJT and MOSFETs. .
2	To **illustrate** the methods used for AC/DC analysis of transistorized and op-amp based circuits.
3	To **Explain** the working of power semiconductor devices and electrical power converter circuits.
4	To **explain** the working of oscillators, multivibrators, timing circuits and voltage regulators.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	**Explain** the working of diode circuits, transistorized and op-amp based circuits.	Understand
CO2	**Explain** the working of power semiconductor devices such as SCR, GTO, Power MOSFET and IGBT and power electronics circuits.	Understand
CO3	**Explain** the working of oscillators, multivibrators and applications of operational amplifier in analog computations.	Understand
CO4	**Solve** the examples on diode circuits, amplifiers, voltage regulators and op-amp based circuits considering ideal op-amp.	Applying

Module	**Module Contents**	**Hours**
I	**Diode Circuits:** Rectifier circuits, RC filter circuit, Zener diode voltage regulator, voltage multiplier circuits, diode logic circuits, photodiode and LED circuits.	**6**
II	**Transistorized Amplifiers:** Amplifier fundamentals, small signal amplifiers: common emitter amplifier, common collector amplifier; JFET/MOSFET common source/ common drain amplifier, frequency response of amplifiers.	**8**
III	**Power Amplifiers** Classification of power amplifiers: class-A, class-B, class-AB, class-C power amplifiers; transformer-coupled amplifiers, heat sink and its operation	**6**
IV	**Op-Amp Applications**: Differential amplifier, unity gain buffer (voltage follower), voltage comparator, zero crossing detector, effect of positive feedback, Schmitt trigger circuit, multivibrators, types of oscillator, RC oscillators, monolithic timers (IC555).	**7**
V	**Power Semiconductor Devices and Circuits:** SCR, TRIAC, DIAC, GTO, Power MOSFET and IGBT; controlled rectifiers, ac voltage controllers, inverter, chopper, UPS,	**6**
VI	**Regulated DC Power Supply:** Block diagram of regulated dc power supply, Zener diode voltage regulator, op-amp based voltage regulator, three terminal IC voltage regulator, switching regulators.	**6**

Textbooks	
1	R. Boylestad and L. Nashelsky, "*Electronic Devices and Circuit Theory*", 9th Edition, PHI, 2009.
2	D. A. Neamen, "*Microelectronics: Circuit Analysis and Design*", 4th Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2021.
3	Ramakant Gaikwad, "Op-amp and Linear Integrated Circuits", 4th edition, Pearson, 2015.
4	M.H. Rashid, "*Power Electronics: Circuits, Devices & Applications*", Third Edition, PHI, New Delhi, 2008.
References	
1	Albert Malvino, David J. Bates, "Electronic Principles", 7th Edition, McGraw Hill Education, 2017.
2	Robert F. Coughlin and Frederick F. Driscoll, "Operational Amplifiers and Linear Integrated Circuits," Pearson Education, 2009.
3	M. D. Singh & K. B. Khanchandani, "*Power Electronics*", Second Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007.
4	
Useful Links	
1	https://nptel.ac.in/courses/108101091
2	https://nptel.ac.in/courses/108105158
3	https://www.tutorialspoint.com/semiconductor_devices/semiconductor_devices_operational_amplifiers.htm
4	https://nptel.ac.in/courses/108/105/108105066/#

CO-PO Mapping

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

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 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)

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Course Information	
Programme	B.Tech. (Computer Science and Engineering - MDM)
Class, Semester	Third Year B. Tech., Sem (V)
Course Code	7MDCS301
Course Name	Software Engineering and Database Essentials
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	Understand importance of engineering approach to software development and comprehend the knowledge of software processes & models practiced at IT industries
2	Be acquainted with the SDLC phases in detail and appreciate the importance of software quality by virtue of software testing methods.
3	To use conceptual designs to prepare database schemas.
4	To understand the relational model and the theoretical issues associated with relational database Design..
5	To learn SQL and Database Architectures.

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	explain proficiency to undertake software projects based on software engineering practices	II	Understand
CO2	apply SQL to extract required information from the database. Compare, analyses various ways of writing the queries for a given problem and Differentiating database Architecture	III	Apply
CO3	summarizing the spirit of team-working in SDLC phases & project planning benefits	III	Apply
CO4	describe the conceptual designs of Database, identifies the need, analyse the problem and Design ER diagram as well as prepare the relational database schema.	IV	Analyze

Module	**Module Contents**	**Hours**
I	Introduction Software Engineering Basics, Software Crisis, Need of software engineering approach, Software Processes: project management process, software development process models, Configuration management process, process management process.	6
II	Software Quality & Project Planning, Notion of Software Quality: Quality objectives, Need for improvement, Software quality factors, Quality standards, Project Planning Basics: Project management plan, Cost estimation, Project scheduling, Staffing and personnel Planning, Risk management	7
III	Software Development Phases, Software Requirement Process, Design principles, Structured design methodology, Coding Standards, levels of Testing.	6

IV	Introduction and Database Modelling using ER Model, General introduction to database systems, its advantages and applications, Database System Architecture, Database users and Administrator, Data models, DBMS, DB languages, View of DB, Data Models, ER Model: Entity set, Entity types, attributes, Notations, Relationship sets, Relationship types, Keys- super key, candidate key, primary key, Extended Features: Generalization, Specialization, aggregation	6
V	Relational Model and SQL, Structure of Relational Database, Reduction of ER model into Relational schemas, Schema-instance distinction, Key, Relational algebra, Tuple and Domain relational calculus, Example queries, SQL: Introduction, DDL with constraints, Insert, Update, Delete, Set Operations, Aggregate functions, group by/having, Nested Queries, Views, Joins.	8
VI	Database Architectures, Centralized &Client-Server architectures, server system architecture, parallel databases, Distributed DB concepts, Homogeneous & Heterogeneous DBs, data fragmentation, replication, allocation techniques	6

Textbooks	
1	Pankaj Jalote, "An integrated approach to S/W engineering", Narosa Publishers, 2nd Edition
2	Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts, Mc-Graw Hill, 4th Edition 2002 / 6th Edition 2011
3	Pankaj Jalote, "Software Project Management in practice", Pearson education

References	
1	Roger S. Pressman, "Software Engineering: Practitioner"s Approach". McGraw Hill
2	Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, 3rd Edition. 2002

Useful Links	
1	https://cryptobook.nakov.com
2	https://www.cs.umd.edu/~jkatz/crypto/

CO-PO Mapping

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

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 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)

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Course Information	
Programme	B.Tech. (Computer Science and Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	7MDCS321
Course Name	Machine LEarning in Practice
Desired Requisites:	Basics of probability, statistics and calculus

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 fundamentals and applications of Artificial Intelligence and Generative AI.
2	To train exploratory data analysis required for Machine Learning tasks.
3	To familiarize learning paradigms in Machine Learning and their applications.
4	To acquaint with use of algorithms for solving machine learning tasks.

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	grasp basic concepts of AI, GenAI, their components, uses and applications.	II	Understanding
CO2	explain data pre-processing, learning paradigms and algorithms in Machine Learning.	II	Understanding
CO3	use GenAI tools and techniques in data pre-processing and Machine Learning to solve simple AI problems.	III	Applying
CO4	identify data pre-processing techniques, learning paradigms and techniques applicable for real-life scenarios.	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Introduction** What is AI, what is data, AI terminologies, Machine Learning vs Data Science vs Deep Learning, Supervised, unsupervised and reinforcement learning paradigms, workflow of a Machine Learning project, tools used, bias in AI, attacks in AI systems, AI applications, state-of-the-art case study.	5
II	**Exploratory Data Analysis** Data summarization, Data cleaning: handling missing values, removing noise from data, handling categorical features, feature selection and reduction, Data standardization, Data visualizations, Introduction to python libraries required for EDA.	7
III	**Supervised Learning I** Introduction, Train, dev and test dataset, Linear regression, evaluation measures in regression, cross validation, ensemble learning – bagging, boosting and stacking.	7
IV	**Supervised Learning II** Logistic regression, Naïve Bayes, Decision tree, evaluation metrics, Bias-variance trade off, Regularization	8

V	**Unsupervised Learning** **Clustering:** Agglomerative clustering, K means, DBSCAN. **Outlier detection:** Univariate techniques, kNN, iForest.	8
VI	**GenAI and state-of-the-art application** Basics of GenAI, Introduction to LLM, Prompt engineering, tools in the market, an application case study.	5

Textbooks	
1	Stuart Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", Prentice Hall, 3rd Edition, 2009
2	Oliver Theobald, Machine Learning for Absolute Beginners
3	Han, Jiawei, Jian Pei, and Hanghang Tong. Data mining: concepts and techniques. Morgan kaufmann, 2022.
References	
1	Machine Learning in Action by Peter Harrington
Useful Links	
1	https://www.deeplearning.ai/courses/ai-for-everyone/
2	Machine Learning Specialization on deeplearning.ai: Link
3	https://www.deeplearning.ai/courses/generative-ai-for-everyone/

CO-PO Mapping

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

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 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)

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AY 2024-25

Course Information

Programme	B.Tech. (Computer Science Engineering - MDM)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	7MDC S3371
Course Name	Machine Learning in Practice Lab
Desired Requisites:	Basics of python programming

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	2	30	30	40	100
		Credits: 1			

Course Objectives

1	To inculcate programming fundamentals required for Machine Learning projects.
2	To introduce tools for Machine Learning projects and python libraries.
3	To impart skills for selection of appropriate data pre-processing and Machine Learning techniques.
4	To infuse abilities to use state-of-the-art technologies to design and develop AI projects.

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	grasp fundamentals of python libraries used for Machine Learning.	II	Understanding
CO2	implement data pre-processing and machine learning techniques on given dataset.	III	Applying
CO3	test accuracy of machine learning techniques on given dataset.	IV	Analysing
CO4	select appropriate data pre-processing techniques and machine learning techniques based on their performance.	V	Evaluating
CO5	design a complete solution for solving real-life scenarios.	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Revisiting python basics and introduction to libraries required for Machine Learning.
2. Know your data: Load dataset in python, summarize it, compute simple central tendencies, slicing and dicing using pandas.
3. Perform data pre-processing: Removing missing data and anomalies, standardization and normalization, feature reduction.
4. Perform data visualizations.
5. Implementation of linear regression and performance evaluation.
6. Implementation of logistic regression and performance evaluation.
7. Implementation of Naïve Bayes and performance evaluation.
8. Implementation of Decision tree and performance evaluation.
9. Implement cross validation and ensemble learning.
10. Implement univariate anomaly detection, iForest and analyse reported anomalies.
11. Implement k-means clustering and analyse results.
12. Implement Agglomerative clustering and analyse results.
13. Perform prompt engineering on latest GenAI tool for different types of data.

Textbooks

1	Bell J., "*Machine Learning Hands-On for Developers and Technical Professionals*", Wiley 2015
2	Müller, Andreas C., and Sarah Guido. Introduction to machine learning with Python: a guide for data scientists. " O'Reilly Media, Inc.", 2016.

References	
1	Ekin, Sabit. "Prompt engineering for ChatGPT: a quick guide to techniques, tips, and best practices." Authorea Preprints (2023).
2	Yashwanth Sai Palghat, Prompt Engineering: The Art of Asking
3	Tushar Kute, Python Programming, Prakrut Publication
Useful Links	
1	https://scikit-learn.org/
2	https://www.datacamp.com/tutorial/machine-learning-python

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1			1	1						1			1	1
CO2			2	2	3					1		2	2	
CO3			2	2	3					1		2	2	
CO4			2	3	2					1		2	2	
CO5			3	1						1			1	
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				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing (min 40 %), LA1+LA2 should be min 40%				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

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Course Information

Programme	B.Tech. (Computer Science and Engineering - MDM)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	7MDCS322
Course Name	MDM Elective-1 Internet of Things
Desired Requisites:	Basics of Networking and Programming

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
		Credits: 03			

Course Objectives

1	To introduce the fundamental concepts, architecture, and societal relevance of the Internet of Things (IoT).
2	To explore communication protocols and interface standards essential for IoT systems.
3	To understand the roles of sensors, actuators, and cloud platforms in IoT application development.
4	To examine real-world IoT applications and analyse their effectiveness in various domains such as healthcare, industry, and smart cities.

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	Explain the fundamental concepts, communication principles, and societal applications of IoT, including the role of cloud technologies.	II	Understand
CO2	Develop simple IoT applications by integrating sensors, actuators, and microcontrollers using appropriate communication protocols.	III	Apply
CO3	Analyse IoT system architectures and data flow mechanisms for device integration, data acquisition, and cloud-based storage.	IV	Analyse
CO4	Evaluate the effectiveness of IoT solutions in real-world scenarios such as smart cities, industrial automation, and healthcare, with respect to performance, scalability, and societal impact.	V	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction to IoT: -** Introduction to Internet of Things (IoT), Functional Characteristics, Recent Trends in the Adoption of IoT, Role of cloud in IoT, Societal Benefits of IoT: - Health Care, Machine to Machine (M2M).	
II	**Communication Principles: -** RFID, ZigBee, Bluetooth, Internet Communication- IP Addresses - MAC Addresses , IEEE 802 Family of Protocols , I/O interfaces Software Components.	
III	**Sensing and Actuation: -** Definition of Sensor, Sensor features, Resolution, Classes, Different types of sensors, Actuator, purpose of Sensors and Actuators in IoT.	

IV	**IoT Application Development: -** Frame work for IoT Applications-Implementation of Device integration, Data acquisition and Integration, Device data storage on cloud/local server, Authentication, authorization of Devices.	
V	**Cloud computation: -** Evolution of Cloud Computation, Commercial clouds and their features, open source IoT platforms, cloud dashboards, Interfacing and data logging with cloud: Blync, Thing speak, platforms.	
VI	**IoT Case Studies: -** IoT Case studies based on industrial Automation, Transportation, Smart cities, smart supply chain, Remote site monitoring .	

Textbooks	
1	Adrian Mcewen, Hakin Cassimally, "Designing The Internet of Things", First Edition, Wiley, 2014.
2	Keysight Technologies, "The Internet of Things: Enabling Technologies and Solutions for Design and Test", Application Note, 2016.
3	Vijay Madisetti, Arshdeep Bahga," Internet of Things A Hands-On- Approach",2014, ISBN:978 0996025515.

References	
1	Raj Kamal , " Internet of Things: Architecture and Design", McGraw Hill.2nd edition June 2022
2	Pethuru Raj, Anupama C. Raman," The Internet of Things Enabling Technologies, Platforms, and Use Cases", Taylor and Francis group. February 2017
3	Peter Waher, "Mastering Internet of Things: Design and create your own IoT applications using Raspberry Pi 3", First Edition, Packt Publishing, 2018.

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc19_cs65/preview
2	

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	1				2	1			1			1	
CO2	1		2		2				1	1			2	
CO3		1	2	2	1	2							3	2
CO4		2	2	3	1	3	2	1	1	2			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 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 2025-26

Course Information	
Programme	B.Tech. (Computer Science Engineering - MDM)
Class, Semester	Third Year B. Tech., Sem
Course Code	7MDC S3372
Course Name	MDM Elective-1 Internet of Things Lab
Desired Requisites:	Basics of Networking and Programming

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	-	30	30	40	100
		Credits: 01			

Course Objectives	
1	Understand the fundamental concepts of IoT systems, including sensors, actuators, microcontrollers, and communication protocols.
2	Apply microcontroller programming skills to interface various sensors and actuators for real-world IoT applications.
3	Analyse and interpret sensor data through local displays, web servers, and cloud platforms to monitor and control IoT devices.
4	Design and develop functional IoT prototypes using cloud integration, wireless communication, and automation technologies.

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	Explain the architecture of IoT systems and the roles of sensors, actuators, and communication protocols used in typical IoT applications.	II	Understand
CO2	Implement IoT applications by interfacing microcontrollers with sensors and actuators using appropriate programming techniques.	III	Apply
CO3	Analyse sensor data and network behaviour in IoT systems using local and remote data handling methods such as web servers and cloud platforms.	IV	Analyse
CO4	Evaluate and develop integrated IoT prototypes with cloud connectivity and automation features to solve real-world problems.	V	Evaluate

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Blinking LED using Arduino/NodeMCU
2. Reading Temperature and Humidity using DHT11 Sensor
3. Controlling LED using Web Interface (ESP8266/ESP32)
4. Controlling Servo Motor using IoT Interface
5. Creating a Wi-Fi Based Web Server using ESP8266/ESP32
6. Sending Sensor Data to ThingSpeak Cloud Platform
7. Displaying Sensor Data on OLED Display
8. Implementing MQTT Protocol using ESP and Public Broker
9. IoT-Based Home Automation System
10. Data Logging on SD Card using Arduino
11. Smart Parking System using IR Sensor
12. Voice-Controlled Device using Google Assistant and IFTTT
13. Smart Street Light System using LDR

Textbooks	
1	Vijay Madisetti, Arshdeep Bahga," Internet of Things A Hands-On- Approach",2014, ISBN:978 0996025515.
2	Jeeva Jose "Internet of Things", January 2018, ISBN:978-9386173591

References	
1	Dieter Uckelmann, Mark Harrison, Florian Michahelles, "Architecting the Internet of Things", April 2011, ISBN:978-3642191572
2	Adrian Mcewen , Hakim Cassimally, "Designing the Internet of Things", December 2013, ISBN: 978-1118430620

Useful Links	
1	https://nptel.ac.in/courses/106105166

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2	1										1	
CO2	2	2	3		3								2	2
CO3	2	3	2	3	3								2	
CO4	1	2	3	3	3	2	2	2	2	2	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, and preferably to only one PO.

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing (min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks

LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

Walchand College of Engineering, Sangli

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AY 2024-25

Course Information	
Programme	B.Tech. (Computer Science and Engineering- MDM)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	
Course Name	Data Analytics
Desired Requisites:	Nil

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

Course Objectives	
1	To differentiate between different types of data.
2	To apply statistical techniques to explore data.
3	To develop different visualizations that effectively communicate data findings.
4	To apply simple machine learning techniques to predict relationship among data.

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 fundamental concepts and importance of data analytics in various domains.	II	Understanding
CO2	apply appropriate techniques to gain knowledge from data.	III	Applying
CO3	illustrate various statistical and machine learning approaches to discover relationship among data.	III	Applying
CO4	construct clear and insightful visualizations among data.	IV	Analyzing

Module	**Module Contents**	**Hours**
I	**Introduction to Data Analytics** Data analytics importance and overview, data analytics benefits Terminologies in data analytics, Data categorization (constant and variable; discrete and continuous; Qualitative and Quantitative; structure, semi structured and unstructured, cross-sectional, time-series and panel), data measurement scale. Types of Analytics(Descriptive, predictive, prescriptive, diagnostic) Descriptive Analytics: Measures of Central Tendency, Measures of Variation, Measures of Shape and symmetry, Fundamentals of Python useful in data analytics.	**7**
II	**Probability Distributions** Conditional Probability and Bayes Theorem, Random variable and probability distribution. Probability Density Function (PDF)and Cumulative Distribution Function (CDF) of a Continuous Random variable. Various probability distribution (Binomial, Poisson, Uniform, Exponential, Normal)	**6**

III	**Inferential Statistics** Sampling and its various techniques, Estimation, Sampling distribution of mean and proportion, Normal distribution and z - statistic, Central limit theorem, Confidence Interval estimation for mean and proportion, sample size estimation, estimation of parameters. **Basic Analysis Techniques** One Sample test (Hypothesis testing, Z-test, t-Test) Two Sample test (Analysis of variance, Correlation analysis) Chi-Square test	**7**
IV	**Data Visualization** Graphical representation of data, Characteristics and charts for effective graphical displays, Dot plot, Jitter plot, Error bar plot, Box-and whisker plot, Histogram, Bar chart, Scatter plot, Line plot. Open source tools like PowerBI, Tableu etc.	**6**
V	**Machine Learning basics** Supervised and unsupervised machine learning, Regression: Simple and multiple linear regression, classification: Naïve bayes, Decision tree, ANN etc.	**7**
VI	**Data analytics: Case studies** How Google, LinkedIn, Amazon, Netflix uses analytics Data analytics in media and entertainment industry, education, government, weather forecasting.	**6**

Textbooks	
1	Business Analytics: The Science of Data - Driven Decision Making - The Science of Data - Driven Decision Making, U Dinesh Kumar, Wiley India.
2	Douglas C. Montgomery, George C. Runger (2002). Applied Statistics & Probability for Engineering. "John Wiley & Sons, Inc"
3	Data Science & Analytics, V.K. Jain, Khanna Book Publishing, New Delhi

Reference Books	
1	Philipp Janert, Data Analysis with Open Source Tools, Shroff Publisher Publisher /O'Reilly Publisher Media.
2	Business Analytics: The Science of Data - Driven Decision Making - The Science of Data - Driven Decision Making, U Dinesh Kumar, Wiley India.

Useful Links	
1	Data Analytics using Python- https://onlinecourses.nptel.ac.in/noc21_cs45/preview
2	Introduction to Data Analytics, https://nptel.ac.in/courses/110/106/110106072/

CO-PO Mapping

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

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 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	B.Tech. (Computer Science Engineering - MDM)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	
Course Name	Data Analytics lab
Desired Requisites:	Basics of python programming

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	-	30	30	40	100
		Credits: 01			

Course Objectives

1	To understand the characteristics of data using descriptive statistics.
2	To use probability distributions and conditional probability to analyze data and understand underlying patterns.
3	To train students to apply inferential statistical and machine learning techniques to draw meaningful conclusions from data.
4	To develop students' ability to create and interpret various graphical representations of data to effectively communicate insights and findings.

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 statistical and probabilistic methods to analyze and interpret data effectively.	III	Applying
CO2	Implement different inferential statistical and machine learning techniques to make data-driven decisions.	III	Applying
CO3	Identify various data insights with help of statistical tests and correlation analysis.	IV	Analyzing
CO4	Select appropriate data visualization techniques to understand data.	V	Evaluating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Programs based on usefulness of python libraries like NumPy, pandas, Scipy required for data analytics.
2. Perform descriptive analytics of the given data.
3. Generate Probability Density Function (PDF) and Cumulative Distribution Function (CDF) for given data.
4. Perform various distributions on the given dataset to gain an insight into the relation between various attributes.
5. Generate different confidence interval for population mean and standard deviation for given data.
6. Estimate various population parameters from sample statistics for the Indians Diabetes Dataset.
7. Perform one-sample tests on the selected dataset to generate data analysis outcomes.
8. Perform two-sample tests on the selected dataset to generate data analysis outcomes.
9. Generate various graphical visualizations for given data.
10. Implement simple/multiple linear regression.
11. Implement Naïve bayes classification.
12. Perform Analytics of data to get an insight in Educational sector with specific data analytics tool.

Textbooks

1	Business Analytics: The Science of Data - Driven Decision Making - The Science of Data - Driven Decision Making, U Dinesh Kumar, Wiley India.
2	Douglas C. Montgomery, George C. Runger (2002). Applied Statistics & Probability for Engineering. “John Wiley & Sons, Inc”
3	Data Science & Analytics, V.K. Jain, Khanna Book Publishing, New Delhi
4	Python for data science for dummies 2nd Edition, John Paul Mueller, Luca Massaron, and Wiley
References	
1	McKinney, W. (2012). Python for data analysis: Data wrangling with Pandas, NumPy, and Python. " O'Reilly Media, Inc.".
2	Philipp Janert, Data Analysis with Open Source Tools, Shroff Publisher Publisher /O’Reilly Publisher Media.
Useful Links	
1	Data Analytics using Python- https://onlinecourses.nptel.ac.in/noc21_cs45/preview
2	Introduction to Data Analytics, https://nptel.ac.in/courses/110/106/110106072/

CO-PO Mapping

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

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing (min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

Walchand College of Engineering, Sangli

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AY 2025-26

Course Information	
Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V (MDM Course)
Course Code	
Course Name	Database system and Web Technology
Desired Requisites:	Fundaments of Information Technology, Programming Basics

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

Course Objectives	
1	To introduce basic concepts of database management systems
2	To impart conceptual designs for databases and working with SQL
3	To develop simple web form using web technologies

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	Summarize the relational database system	II	Understanding
CO2	Determine the use of basics of HTML and CSS styles	II	Understanding
CO3	Execute databases using Query languages	III	Applying
CO4	Implement Web Forms and web pages using front end technologies	III	Applying
CO5	Construct a simple web application with database connectivity	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Introduction of database system and relation model:** Database Systems, view of data, Database design, Data abstraction, Data Models, Architecture of Database Systems, Entity-Relationship Model Relational model: Structure of Relational Databases, database schema, keys,	6
II	**Integrity Constraints and Design:** Domain Constraints, Referential Integrity, Normal forms, Functional Dependencies Features of Good Relational Designs, Database Decomposition	6
III	**Structured Query Language (SQL):** Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Aggregate Functions	7

IV	**HTML and CSS Basics:** Creating simple HTML Page with Headings, Paragraphs, Lists, working with Hyperlinks, tables, DIVs, Introduction to CSS styles, Styling HTML elements: text, colour, background, borders, creating layouts using CSS positioning and floats	6
V	**Introduction to JavaScript and Document Object Model (DOM):** Basics of JavaScript Programming language, variables, Data Types, Operators, JavaScript's Functions and control structures DOM and its significance, Manipulating HTML Elements using JavaScript, Handling Events and User Interaction	7
VI	**Web Forms and Data validation:** HTML form Attributes, Form Elements, Input Types, Input Attributes, Creating HTML Forms for user input, Form Handling using JavaScript, server side scripting, Building a simple server side application	6
Textbooks		
1	Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, "*Database System Concepts*", McGraw-Hill Education, 6th Edition, 2010.	
2	Raghu Ramakrishnan, "*Database Management Systems*", McGraw-Hill Education, 3rd Edition, 2003	
3	Web Technology: Theory and Practice by M. Srinivasan, Pearson India, Released June 2012	
References		
1	C.J.Date, A.Kannan, S.Swamynathan, "*An Introduction to Database Systems*", Pearson Education, 8th Edition, 2006	
2	Web Technologies by Achyut Godbole and Atul Kahate, Tata MacGraw Hill Education Pvt. Ltd	
Useful Links		
1	http://www.nptelvideos.in/2012/11/database-management-system.html	

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	1												
CO2	2	2										1	3	
CO3	1	2			2				1					1
CO4	2		2		3					2			2	
CO5	3		3									2	2	1

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 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 2025-26

Course Information	
Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V (MDM Course)
Course Code	
Course Name	Database Engineering and Web Technology Lab
Desired Requisites:	Basic knowledge of Computer and Designing

Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
		30	30	40	100
		Credits: 1			

Course Objectives	
1	To discuss fundamentals DDL, DML, DQL, DCL Commands
2	To describe interacting with databases using query languages
3	To Demonstrate JavaScript for dynamic effects and prepare PHP scripts.
4	To implement XML documents and XML Schema

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	Explain ER Model and Convert entity relationship diagrams into RDBMS	II	Understanding
CO2	Demonstrate proficiency of SQL syntax and use it to interact with database	III	Applying
CO3	Implement static and dynamic web pages.	III	Applying
CO4	Demonstrate the incorporation of CSS and JAVASCRIPT in HTML	IV	Analyzing

List of Experiments / Lab Activities/Topics

List of Lab Assignments: (Minimum 10)

Database Engineering Lab

1. Identify entity, its attributes to draw ER diagram for database schema design.
2. Create database tables and write SQL queries to retrieve information from the database using DDL and DML commands. Give Primary key and foreign key constraints.
3. Perform Data Control Language (DCL) and Transaction Control Language (TCL) command in SQL
4. Study of various types of integrity constraints (NOT NULL Constraint, DEFAULT Constraint, UNIQUE Constraint, PRIMARY Key, FOREIGN Key, CHECK Constraint).
5. Implementation of DML commands of SQL with suitable examples. Perform Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on specific conditions.
6. Perform Aggregation and group by, having clause queries to retrieve summary information from the database.

Web Technology Lab

1. Implement a program to design static web page required for an online bookstore website.
   1. Home Page
   2. Login Page
   3. Catalogue Page : The catalogue page should contain the details of all the books available in the website in a table.
   4. Registration Page.
2. Create a HTML form for a student for course registration which should have following fields:
   1. Student Name (textbox)
   2. Age (textbox with numbers only)
   3. Date of Birth (Calendar)
   4. Select Course (Drop Down)
   5. Submit and Cancel (Button)
3. Program On CSS properties in HTML page:
   a) Develop and demonstrate the usage of inline, internal and external style sheets using CSS.
   b) Design and develop web pages by applying CSS text formatting properties, such as Text Alignment, Text Decoration, Text Transformation, Text Spacing, Text Shadow, Font family, Font style Font Size, etc. Also apply CSS colors and backgrounds properties, such as color, RGB, HEX, HSL values, background image, background color, etc.
   c) Design and develop web pages by using CSS Selectors.
4. Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:
   a) Input: Click on Display Date button using onclick( ) function
      Output: Display date in the textbox
   b) Input: A number n obtained using prompt
      Output: Factorial of n number using alert
   c) Input: A number n obtained using prompt

Output: A multiplication table of numbers from 1 to 10 of n using alert

d) Input: A number n obtained using prompt and add another number using confirm

Output: Sum of the entire n numbers using alert.

5 a) Implement a script using JavaScript that shows use of JavaScript conditionals and loops for web pages.

5 b) Implement a script using JavaScript that shows use of JavaScript Functions, Arrays, and Objects for web pages.

Textbooks	
1	Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, "Database System Concepts", McGraw-Hill Education, 7th Edition, 2019.
2	Raghu Ramakrishnan, "Database Management Systems", McGraw-Hill Education, 3rd Edition, 2003.
3	Kogent Learning Solution Inc.,"Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET ,XML and Ajax, Black Book", Dreamtech Press ,1st Edition,2009.
4	Jhon Duckeet ,"HTML and CSS:Design and Building Websites ",Jhon Willey and Sons,Inc".1st Edition, 2011.

References	
1	Vinicius M. Grippa, Sergey Kuzmichev, "Learning MySQL: Get a Handle on Your Data", O'reilly, 2nd edition 2021
2	Hector Garcia-Molina, Jeffrey D. Ullman, " Database Systems: The Complete Book", Pearson, 2nd Edition, 2014
3	Steven M Schafer, "HTML, XHTML and CSS" Wiley India Education,5th Edition, 2010
4	Thomas A. Powell,,"The Complete Reference :HTML & CSS", McGraw Hill Education, 5th Edition,2017.

Useful Links	
1	https://nptel.ac.in/courses/106/105/106105175/
2	https://onlinecourses.swayam2.ac.in/nou25_cs09/preview

CO-PO Mapping

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

There are three components of lab assessment, LA1, LA2 and Lab ESE.

IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.				

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

AY 2025-26

Course Information

Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem VI (MDM Course)
Course Code	
Course Name	Operating System and Computer Network
Desired Requisites:	Computer Architecture

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 concepts, functions and services of operating systems.
2	To inculcate the concepts of process communication, file and memory management techniques.
3	To acquire foundational knowledge of networks and the challenges involved in their implementation.
4	To explore wireless, mobile communication and other latest trends in the network.

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	Examine the functions and services provided by operating systems.	II	Understanding
CO2	Explore the concepts of file system and memory management and analyze the process, threads and scheduling techniques.	III	Applying
CO3	Study network architectures, the client/server model, and essential of layered protocols	IV	Analyzing
CO4	Discuss and understand network configuration and wireless and Mobile communications	IV	Analyzing

Module	**Module Contents**	**Hours**
I	**Introduction to Operating system:** Notion of operating systems, Computer system organization, Computer System architecture, Computer System Structure, Basics of Operating System Operations, Process Management, Memory Management, Storage Management, protection and security. **System Structure:** Operating system services, user operating system interface, system calls, types of system calls, system programs, operating system design and implementation.	6

II	**Process Management in Operating Systems:** Process Concept, Operation on process, Cooperating process, Threads, Inter-process Communication, **Process Scheduling:** Basic concept, Scheduling Criteria , Introduction to scheduling algorithms, Multiple processor scheduling, Real time scheduling.	7
III	**Memory and File System Management** Background, Memory Allocation (Fixed, Dynamic), Logical Versus Physical Address space, Paging and Segmentation, swapping, Virtual Memory, Demand Paging. File System Management:- File concept, access methods, directory and disk structure, file-system mounting, file sharing, protection.	7
IV	**Introduction to Network Concepts :** What Is the Internet, The Network Core ,Delay, Loss, and Throughput in Networks ,Layered Architecture, Protocol Layers and Their Service Models Principles of Network Applications , Web and HTTP ,Electronic Mail in the Internet ,DNS—The Internet's Directory Service ,Video Streaming and Content Distribution Networks , Introduction to Socket Programming	6
V	**Major layers of TCP/IP model:** Introduction and Transport-Layer Services ,Multiplexing and De multiplexing , Connectionless Transport: UDP ,Connection-Oriented Transport: TCP , Overview of Network Layer , Switching , Router , Internet Protocol (IP): IPv4, Addressing, IPv6, Basics of Routing Algorithms	7
VI	**Wireless , Mobile and other Technologies:** Wireless and mobile networks-WiFi: 802.11 Wireless LANs, Cellular Internet Access, Mobile IP ,Wireless Links and Network Characteristics Network management including SNMP. Network troubleshooting, Introduction to SDN and other latest trends in network	6

Text Books	
1	James. L. Peterson and A. Silberchatz ,"*Operating System Concepts*", Addison Westley Publication, 9th Edition,2018
3	James F. Kurose, Keith W. Ross, *"Computer Networking: A Top-Down Approach", 7*th Edition, Pearson Publication.
References	
1	William Stallings," *Operating Systems : Internals and Design Principles*",Peterson Publication,7th Edition,2013
2	Crowley Charles ," *Operating Systems : A Design-Oriented Approach*",Mc Graw Hill Publication,1st Edition,2017
3	Dr. Sunilkumar Manavi and M. Kakkasageri, "Wireless and mobile networks concepts and protocols", Wiley publication, 2nd edition, 2016
Useful Links	
1	https://onlinecourses.swayam2.ac.in/cec20_cs06/preview
2	https://onlinecourses.nptel.ac.in/noc22_cs19/preview

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