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	7MCV301
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**

	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	7MCV321
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.	7
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.	7
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.	6
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).	7
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	6

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.	6

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).

Prepared by	DAC/BoS Secretary	Head/BoS Chairman

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26

Course Information	
Programme	Minor in CAD/CAM & Automation
Class, Semester	Sem IV
Course Code	7MME221
Course Name	Fundamentals of CAD/CAM
Desired Requisites: AutoCAD, basic drafting techniques etc.	

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

Course Objectives

1	To impart the knowledge on basic fundamentals, principles and working of various NC, CNC machines and CMM.
2	To explain the students about recent developments in CNC machines and part programming methods for CNC turning and milling operations.
3	To make students aware of different types of cutting tools for machining operations.
4	To develop the students for mathematical representation of geometries and different tolerance techniques.
5	To make students aware of computer use for data exchange formats and tools.

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 appropriate operation and CNC machines for machining.	II	Understanding
CO2	Develop part programs for CNC machining.	III	Applying
CO3	Examine mathematical model to transform the geometries.	IV	Analyze
CO4	Discuss applications of different database management principles in CAD/CAM.	V	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction to CAD/CAM and CNC Tools** Automation in manufacturing, product cycle with and without CAD/CAM, Types of productions, Numerical control definition and history. Main components of NC system, NC Procedure, NC motion control system, Advantages and disadvantages of NC, CNC, DNC, etc. CNC machine tools, principle of operation of CNC, construction features including structure, drive system, tool-work movement actuation system, feedback system, machine control system.	4
II	**Different components of CNC tools** CNC Tooling- Different types of tools and tool holders used on CNC machines, parameters for selection of configuration of cutting tools, Modular tools and fixtures, use of pallets for work holding, palletizing of fixtures.	4

III	**CNC Programming** CNC Programming - Detailed manual part programming on Lathe and machining centres using G and M codes, APT programming-Punched tape in NC, tape coding and formats, APT language, Circular and linear interpolation, CNC programming - Tool length compensation, cutter radius compensation, sub routine, DO loop, Canned Cycle, etc. Optimization of tool path (to reduce machining time).	5
IV	**Geometric Modeling and Analysis** Types of mathematical representation of curves, surfaces, Solid Representation - Boundary Representation (B-rep), Constructive Solid Geometry (CSG) and other methods, Feature Based Modeling, Assembly Modeling, Behavioral Modeling, Conceptual Design & Top-down Design, Modeling of product in CAE softare and analysis techniques using approximation and matrix method. Data exchange formats like IGES, STEP etc.	4
V	**Geometry Transformation** Introduction and need of transformation, Mathematical models of Translation, scaling, reflection, rotation, homogeneous representation, concatenated transformation. Mapping of geometric model, visual realism, projections of geometric model.	5
VI	**Computer Aplication in Design, Manufacturing and Analysis** Collaborative Design, Principles, Approaches, Tools, Design Systems. Product Data Management (PDM), concurrent engineering, PLM concept.	4

Text Books	
1	Geoffrey Boothroyd and Winston A. Knight, "*Fundamentals of machining and machine tools*", Third Edition, CRC Mechanical Engineering.2000
2	Jon Stenerson and Kelly Curran "*Computer Numerical Control: Operations and Programming*", Prentice-Hall of India Pvt. Ltd. New Delhi, 2007.
3	B.S. Pabla, M.Adithan, " *CNC Machines*", New Age International (P) Publishers, First Edition 1994, Reprint 2005.

References	
1	Mikell P. Groover, Emory W. Zimmers, "*CAD/CAM: Computer-Aided Design and Manufacturing*", Prentice-Hall, 1984.
2	Ibrahim Zeid, " *Mastering CAD/CAM*", Tata McGraw Hill Education Pvt Ltd., New Delhi, Special Indian Edition, 2007, Ninth Reprint 2010.
3	Ibrahim Zeid, R. Sivasubramanian, "*CAD/CAM: Theory and Practice*", Tata McGraw Hill Companies, Special Indian Edition, 2009.

Useful Links	
1	https://archive.nptel.ac.in/courses/112/102/112102101/
2	https://nptel.ac.in/courses/112104031
3	https://archive.nptel.ac.in/courses/112/102/112102103/

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

CO4					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

(Government Aided Autonomous Institute)

AY 2025-26

Course Information	
Programme	Minor in CAD/CAM & Automation
Class, Semester	Sem IV
Course Code	7MME271
Course Name	CAD/CAM Lab
Desired Requisites:	Basics of Engineering Drawing

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

Course Objectives	
1	To develop hands-on skills in CNC programming and operation.
2	To model and analyze parts using CAD software.
3	To demonstrate understanding of geometric transformations and data exchange.
4	To develop projects involving CAD/CAM integration.
5	To understand simulation and verification techniques in CNC and CAD.

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	Create CAD models and perform assembly operations using software tools.	II	Understanding
CO2	Write and simulate CNC part programs for turning and milling operations.	III	Applying
CO3	Apply geometric transformations to design models.	III	Applying
CO4	Analyze CAD models using CAE software tools.	IV	Analysing

List of Experiments / Lab Activities/Topics

1) CAD Modeling: 2D sketching and 3D modeling of machine parts using software.
2) Assembly Modeling: Creation of assembly using modeled parts and motion simulation.
3) Geometric Transformation: Apply translation, rotation, scaling on 2D/3D models using CAD tools.
4) CNC Turning Program: Write and simulate G & M code for a simple turning job.
5) CNC Milling Program: Write and simulate G & M code for a simple milling job.
6) Tool Path Optimization: Modify the CNC code to optimize tool path and reduce machining time.
7) Data Exchange: Import and export CAD files using formats such as IGES/STEP.
8) CAE Analysis: Perform basic static analysis on a CAD part using CAE software.
9) Mini Project: Integrative CAD/CAM based project (modeling, analysis, CNC programming).

Textbooks	
1	Geoffrey Boothroyd and Winston A. Knight, "*Fundamentals of machining and machine tools*", Third Edition, CRC Mechanical Engineering.2000
2	Jon Stenerson and Kelly Curran "*Computer Numerical Control: Operations and Programming*", Prentice-Hall of India Pvt. Ltd. New Delhi, 2007.
3	B.S. Pabla, M.Adithan, " *CNC Machines*", New Age International (P) Publishers, First Edition 1994, Reprint 2005.
References	
1	Mikell P. Groover, Emory W. Zimmers, "*CAD/CAM: Computer-Aided Design and Manufacturing*", Prentice-Hall, 1984.
2	Ibrahim Zeid, " *Mastering CAD/CAM*", Tata McGraw Hill Education Pvt Ltd., New Delhi, Special Indian Edition, 2007, Ninth Reprint 2010.
3	Ibrahim Zeid, R. Sivasubramanian, "*CAD/CAM: Theory and Practice*", Tata McGraw Hill Companies, Special Indian Edition, 2009.
Useful Links	
1	https://archive.nptel.ac.in/courses/112/102/112102101/
2	https://nptel.ac.in/courses/112104031
3	https://archive.nptel.ac.in/courses/112/102/112102103/

CO-PO Mapping

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26

Course Information	
Programme	Minor-CAD/CAM and Automation
Class, Semester	B.Tech
Course Code	
Course Name	Additive Manufacturing
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 the principles, classifications, and processes of additive manufacturing (AM)
2	Compare AM with traditional manufacturing methods for cost, time, and design flexibility.
3	Understand applications and challenges in aerospace, biomedical, automotive, and tooling industries.

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 fundamentals, types, and evolution of additive manufacturing processes.	II	Understand
CO2	Select appropriate additive manufacturing processes and materials for specific product needs.	III	Applying
CO3	Analyze and interpret the applications, advantages, and limitations of AM technologies.	IV	Analysing
CO4	Evaluate mechanical behavior, quality, and post-processing needs of AM parts.	V	Evaluate

Module	Module Contents	Hours
I	**Introduction to Additive Manufacturing** Classification of Additive Manufacturing (3D Printing), Additive vs Subtractive Manufacturing, Rapid prototyping (RP), Historical development of Rapid Prototyping, Areas of Application (Basic Introduction) Advantages and Limitations of Additive Manufacturing, commonly used Terms,	6
II	**Additive Manufacturing Processes I: Fused Deposition Modelling and Stereo lithography** Fused Deposition Modelling (FDM): FDM Technology, Various FDM Printers and Specifications, Stereo lithography (SLA): Specifications of SLA Printers, Process, working principle, photopolymers, photo polymerization, layering technology, laser and laser scanning, Applications, Process Parameters and specifications, Process, Materials, Application areas and Comparison.	7
III	**Additive Manufacturing Processes II:** Directed Energy Deposition (DED), Material Jetting, Binder Jetting, Powder Bed Fusion (PBF), and Sheet Lamination: Specifications and Working Principles, Key Process Parameters and Operating Models, Materials Used, Process Descriptions and Workflows, Industrial Application Areas, Advantages, Limitations, and Typical Use Cases, Comparative Analysis of Processes Based on Performance and Suitability	6
IV	**Design Potential of Rapid Prototyping:** CAD for Additive Manufacturing Features: 3D Modeling, Slicing, STL file generation, etc.; Traditional Design for Manufacturing and Assembly (DFM, DFMA); Customization and Customer Input; 3D Scanning and Digitization; AM Software: data formats and standardization; Slicing algorithms; Advanced Slicing	7
V	**Post Processing of AM Parts:** Remove Support Material, Improve Surface Texture, Improve Accuracy, Improve Aesthetics, prepare for Pattern Use, and Improve Properties with Non-thermal and Thermal Methods. Specifics of coating, electroplating, welding, priming and painting, sanding, vapor smoothing, polishing, and so on.	6
VI	**Applications of Additive Manufacturing** Checking for form and fit, ergonomic research, functional testing, Applications in the automotive industry, aerospace industry, construction sector, and medical profession, including parts for race cars Quick Tooling: Quick tooling for dies, permanent mold casting, quick tooling for sheet metal forming tools, quick tooling for casting pattern plates, RP for investment casting in serial production, and improvements in additive manufacturing	7

Textbooks	
1	Gibson, I., Rosen, D.W. and Stucker, B., "Additive Manufacturing Methodologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2015.

2	Chua, C.K., Leong K.F. and Lim C.S., "Rapid prototyping: Principles and applications", Third edition, World Scientific Publishers, 2010.
3	Patri K. Venuvinod and Weiyin Ma, Rapid Prototyping: Laser-based and Other Technologies, Springer, 2004.
References	
1	Liou, L.W. and Liou, F.W., "Rapid Prototyping and Engineering applications: A tool box for prototype development", CRC Press, 2011.
2	Kamrani, A.K. and Nasr, E.A., "Rapid Prototyping: Theory and practice", Springer, 2006.
3	Hilton, P.D. and Jacobs, P.F., Rapid Tooling: Technologies and Industrial Applications, CRC Press, 2000
Useful Links	
1	https://archive.nptel.ac.in/courses/112/103/112103306/
2	https://onlinecourses.nptel.ac.in/noc25_mm02/preview
3	https://markforged.com/resources/blog/design-for-additive-manufacturing-dfam
4	https://www.hubs.com/knowledge-base/how-design-parts-metal-3d-printing/
5	https://www.rapidmade.com/design-for-additive-manufacturing
6	https://all3dp.com/1/design-for-additive-manufacturing-dfam-simply-explained/#where-to-learn-dfam

CO-PO Mapping

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

(Government Aided Autonomous Institute)

AY 2025-26

Course Information					
Programme	Minor in CAD/CAM & Automation				
Class, Semester	Sem V				
Course Code	7MME351				
Course Name	Product Development Lab				
Desired Requisites:	Basics of Engineering Drawing, CAD Tools				
Teaching Scheme		**Examination Scheme (Marks)**			
Practical	2 Hrs/ Week	**LA1**	**LA2**	**Lab ESE**	**Total**
Interaction	--	30	30	40	100
		Credits: 1			
Course Objectives					

1	To expose students to the complete product development cycle from concept to prototype.
2	To integrate CAD/CAM tools for part design, modeling, and simulation.
3	To provide hands-on experience in rapid prototyping using additive manufacturing.
4	To enhance team-based problem-solving and design innovation.
5	To develop documentation and communication skills for product realization.

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 design thinking and systematic engineering approach to product development.	III	Applying
CO2	Create and modify product models using CAD software.	IV	Analysing
CO3	Simulate and analyze design performance using virtual tools.	IV	Analysing
CO4	Build, present and document physical prototypes using additive or subtractive methods.	V	Creating

List of Experiments / Lab Activities/Topics

1) Product Design Ideation: Brainstorming, concept sketching, and selection using Pugh matrix or similar methods.
2) 3D CAD Modeling: Part and assembly design using SolidWorks / CATIA / Fusion 360 or equivalent.
3) Design for Manufacturability (DFM): Modifying design considering manufacturing constraints.
4) Static Simulation: Performing basic stress analysis on designed components.
5) Additive Manufacturing: Preparing STL files and 3D printing simple components.
6) Reverse Engineering: 3D scanning or manual measurement of a part and recreating the CAD model.
7) Bill of Materials and Costing: Generating a BOM and basic cost estimation.
8) Rapid Prototyping or Subtractive Manufacturing: Fabricating a prototype via 3D printing or CNC.
9) Mini Project: End-to-end product development involving ideation, design, analysis, and prototype demonstration

Textbooks

1	Karl T. Ulrich and Steven D. Eppinger, "Product Design and Development", Fifth Edition, McGraw-Hill Education, 2011.
2	Geoffrey Boothroyd, Peter Dewhurst, Winston A. Knight, "Product Design for Manufacture and Assembly", Third Edition, CRC Press, 2011.
3	Ibrahim Zeid, "Mastering CAD/CAM", First Edition, Tata McGraw-Hill Education, 2007.

References

1	Chua Chee Kai, K. F. Leong, C. S. Lim, "Rapid Prototyping: Principles and Applications", Third Edition, World Scientific Publishing Company, 2010.
2	K. Venkataraman, "Computer Integrated Manufacturing", Second Edition, New Age International Publishers, 2005.
3	David G. Ullman, "The Mechanical Design Process", Fourth Edition, McGraw-Hill Education, 2010.

Useful Links	
1	https://archive.nptel.ac.in/courses/112/107/112107289/
2	https://archive.nptel.ac.in/courses/112/105/112105234/
3	https://www.youtube.com/watch?v=Cob_2Lav_nw

CO-PO Mapping

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26

Course Information

Programme	Minor
Class, Semester	
Course Code	
Course Name	Smart Manufacturing

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	Introduce students to the key concepts, tools, and technologies that drive Smart Manufacturing in modern industrial settings.
2	Develop practical understanding of advanced manufacturing techniques including additive manufacturing, adaptive CAM, and AI-based quality control.
3	Enable learners to integrate sensors, robotics, and data analytics to create intelligent, collaborative, and responsive manufacturing systems.

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 principles and architecture of smart manufacturing systems	II	Understand
CO2	Apply sensor and edge technologies to monitor and control manufacturing processes	III	Apply
CO3	Analyze the effectiveness of CAM strategies and AI tools in real-time production	IV	Analyse
CO4	Design a smart cell integrating additive manufacturing, robotics, and data analytics	V	Evaluate

Module	Module Contents	Hours
I	**Foundations of Smart Manufacturing** Fundamentals and need for Smart Manufacturing, Differences between Smart, Digital, and Traditional Manufacturing, CAD/ CAM interoperability in real-time manufacturing environments, Role of MES (Manufacturing Execution Systems)	6
II	**Smart Sensors and Edge Technologies** Smart sensors: types, characteristics, calibration, Actuators and edge computing in machine automation, Real-time condition monitoring Sensor fusion and signal pre-processing	7
III	**Adaptive CAM and Advanced Tool path Control** Tool path optimization strategies (adaptive, trochoidal, high-speed), 5-axis machining and post-processing, CNC program automation and closed-loop feedback control, Cloud-based CAM systems (Fusion 360, Siemens NX, etc.)	6
IV	**Additive Manufacturing in Smart Environments** Design for Additive Manufacturing (DfAM), Process parameters and in-situ monitoring, Hybrid manufacturing (additive + subtractive), Post-processing and support removal automation	7

V	**AI for Process Control and Quality** AI-based adaptive process control in machining, Machine vision for defect detection, Real-time feedback and correction using AI, AI applications in CNC diagnostics and tool wear estimation	6
VI	**Human-Machine Collaboration and Automation** Smart HMIs and data dashboards, Collaborative robots (Cobots) in production lines, Digital skill requirements for operators, Safety standards in smart factories (ISO 10218, ISO/TS 15066)	7

Textbooks	
1	Smart Manufacturing: Concepts and Methods, **Author**: Zude Zhou, Shane (Shengquan) Xie, Dejun Chen, **Publisher:** Academic Press (Elsevier), **Year:** 2021
2	Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, **Author**: Ian Gibson, David Rosen, Brent Stucker, **Publisher:** Springer, **Year**: 2021 (3rd Edition)
3	Computer Integrated Manufacturing, **Author**: Mikell P. Groover, **Publisher**: Pearson Education, **Year**: 2014 (3rd Edition)
References	
1	Digital Manufacturing and Automation: Modern Technologies in Manufacturing **Author:** Yi Qin, **Publisher:** Woodhead Publishing**, Year**: 2020
2	Manufacturing Cyber-Physical Systems: Design and Implementation, **Author**: Michael Ford**, Publisher**: Wiley-IEEE Press, **Year**: 2021
3	Artificial Intelligence for Robotics and Industrial Applications, **Author**: R.O. Sinnott, S. Rana, **Publisher**: Springer, **Year**: 2023
Useful Links	
1	https://nptel.ac.in/courses/112105305
2	https://nptel.ac.in/courses/112106270
3	https://nptel.ac.in/courses/106105195

CO-PO Mapping

	Programme Outcomes (PO)												PSO	
CO1	3				1									
CO2		3	2								1	2	1	
CO3	3			2	2	1				1				2
CO4		2	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

(Government Aided Autonomous Institute)

AY 2025-26

Course Information	
Programme	Minor
Class, Semester	
Course Code	7ME3XX
Course Name	Digital Twin Modelling
Desired Requisites:	

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

Course Objectives	
1	To introduce the concept and framework of Digital Twin systems and their evolution.
2	To develop an understanding of real-time sensor integration, modeling, and simulation of physical systems.
3	To equip students with skills to create and analyze digital replicas for predictive maintenance, control, and performance optimization.

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 core principles, architecture, and use cases of Digital Twin systems.	II	Understand
CO2	Develop basic digital twin models for mechanical systems using simulation and live data.	III	Applying
CO3	Analyse sensor-data-driven behaviour and performance of cyber-physical systems.	IV	Analysing
CO4	Evaluate the effectiveness of digital twin frameworks in predictive maintenance and smart manufacturing.	V	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction to Digital Twin Systems** Definition, historical evolution, Digital Twin vs. Simulation vs. IoT vs. Digital Shadow; Key components: Physical system, Digital model, Data exchange; Relevance in CAD/CAM/Automation	6
II	**Architecture and Framework of Digital Twins** Digital Twin architecture layers: physical, data, analytics, visualization; Communication protocols (MQTT, OPC-UA); Twin modelling languages and standards (SysML, FMI, Asset Administration Shell)	7
III	**Modelling Physical Systems and Integration with Sensors** CAD and physics-based modelling, system identification, kinematics and dynamics modelling; Sensor fusion, data acquisition via PLCs/IoT, real-time data streaming and preprocessing	6

IV	**Simulation and Real-Time Co-Simulation** Simulation tools – MATLAB/Simulink, Ansys Twin Builder, Siemens NX; Digital thread, co-simulation frameworks, scenario-based simulation, cyber-physical interface	7
V	**Applications in Predictive Maintenance and Process Optimization** Condition monitoring, health estimation, failure prediction using AI/ML, asset lifecycle management, feedback loops from simulation to operation	6
VI	**Use Cases, Standards, and Industrial Implementation** Digital Twin use cases in manufacturing, aerospace, energy, automotive; Industrial case studies – GE, Siemens, Tesla; Standardization (ISO 23247, RAMI 4.0); Challenges and future trends	7

Textbooks	
1	Michael Grieves, *Digital Twin Driven Smart Manufacturing*, Springer, 2019.
2	Dieter Uckelmann et al., *Architecting the Internet of Things*, Springer, 2011.
3	Rajiv Ranjan et al., *Handbook of Digital Twin*, Springer, 2021.
References	
1	Eberhard Abele et al., *Modeling and Simulation for Digital Twins*, CIRP Annals.
2	IBM Whitepaper, *Digital Twin: The Bridge Between the Physical and Digital*, IBM Research.
3	Siemens Digital Industries, *Digital Twin for Machine Builders*, Whitepaper.
4	Research journals on Digital Manufacturing, IIoT, and Simulation-based design.
Useful Links	
1	https://nptel.ac.in/courses/112/105/112105268/
2	https://www.ibm.com/topics/what-is-a-digital-twin
3	https://blogs.sw.siemens.com/digital-twin/
4	https://www.ansys.com/products/digital-twin
5	https://www.autodesk.com/solutions/digital-twin/overview
6	https://digitaltwinconsortium.org/

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
CO2		2	2	2	1								2	
CO3	1	2	3	1	2								2	1
CO4	2		2		2								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)

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2025-26					
Course Information					
Programme	Minor				
Class, Semester					
Course Code					
Course Name	Industry 4.0				
Desired Requisites:					
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	---	30	20	50	100
		Credits: 3			

Course Objectives	
1	**To introduce students to the fundamental concepts, technologies, and components of Industry 4.0**, including cyber-physical systems, Internet of Things (IoT), and smart manufacturing systems.
2	**To develop an understanding of the integration of CAD/CAM with advanced manufacturing technologies** such as robotics, additive manufacturing, and automation in the context of Industry 4.0.
3	**To enable students to analyze, design, and simulate smart factory systems** using data-driven approaches, digital twins, and industrial communication protocols for real-world applications.

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 key concepts, technologies, and architecture of Industry 4.0 systems	II	Understand
CO2	Apply IoT and cyber-physical system principles to develop smart automation solutions.	III	Apply
CO3	Analyze the integration of CAD/CAM with digital manufacturing technologies.	IV	Analyse
CO4	Design a basic smart factory layout or digital twin model using Industry 4.0 tools.	V	Evaluate

Module	Module Contents	Hours
I	**Introduction to Industry 4.0** Evolution from Industry 1.0 to 4.0, Key design principles: Interoperability, decentralization, modularity, Smart Manufacturing vs. Industry 4.0, Global frameworks: Industrie 4.0 (Germany), Smart Manufacturing Leadership Coalition (USA), India's SAMARTH Udyog	6
II	**Cyber-Physical Systems (CPS) in Manufacturing** Definition and architecture of CPS, Real-world CPS examples in industrial settings, Control loops and distributed systems, Role of embedded systems and sensors in CPS	7
III	**Industrial Internet of Things (IIoT)** IIoT architecture and protocols (MQTT, OPC-UA, HTTP, etc.), Device-to-cloud integration models, Interfacing PLCs and SCADA with cloud platforms, Data latency, bandwidth, and interoperability issues	6
IV	**Digital Twins and Product Lifecycle Management (PLM)** Digital Twin vs. Digital Shadow, PLM systems: design, simulation, operation, and maintenance, End-to-end product traceability, Use cases: Aerospace, Automotive, Medical Devices	7
V	**Big Data and Cloud in Industrial Decision-Making** Big Data architecture: Data lakes, NoSQL, time-series databases, Cloud vs. Edge computing in Industry 4.0, Data-driven maintenance and supply chain optimization, Role of platforms: AWS IoT, Microsoft Azure, Siemens MindSphere	6
VI	**Ethics, Security, and Future Trends** Cyber security concerns in smart industries, Ethics of automation: job displacement, bias in AI, Data ownership and privacy in industrial environments, Upcoming trends: Digital sovereignty, Green Industry 5.0, Hyper-automation	7

Textbooks

1	**"Industry 4.0: The Industrial Internet of Things" Author:** Alasdair Gilchrist **Publisher:** Apress, 2016
2	**"Smart Manufacturing: Concepts and Methods" Authors:** Masoud Soroush, Babak Fahimi, Behzad Bavarian, **Publisher:** CRC Press, 2020
3	**"Introduction to Industrial Internet of Things and Industry 4.0" Authors:** Sudip Misra, Anandarup Mukherjee, Arijit Roy, **Publisher:** CRC Press, 2021

References

1	**"Design Principles for Industry 4.0" Editors:** Luis Romeral Martinez, Muhammad Aamir, **Publisher:** Elsevier/Academic Press, 2020
2	**"Cyber-Physical Systems: From Theory to Practice" Authors:** Danda B. Rawat, Joel J.P.C. Rodrigues, **Publisher:** CRC Press, 2015
3	**"Advanced Manufacturing and Automation VIII" (Lecture Notes in Electrical Engineering, Vol. 503), Editors:** Yi Wang, Xinguo Zhang, Wenshan Yu, **Publisher:** Springer, 2019
Useful Links	
1	https://nptel.ac.in/courses/106105195
2	https://nptel.ac.in/courses/112105297
3	https://nptel.ac.in/courses/112108298

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	3	3	2		1						1	2	1	
CO3	3	2	3	2	2	1				1		2		2
CO4	2	2	3	2	2					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

(Government Aided Autonomous Institute)

AY 2025-26

Course Information	
Programme	Minor
Class, Semester	Sem VII
Course Code	7MME422
Course Name	AIML in Mechanical engineering
Desired Requisites:	

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

Course Objectives	
1	To introduce AI and ML concepts with relevance to mechanical systems and processes.
2	To expose students to supervised, unsupervised learning and deep learning applications in mechanical engineering.
3	To develop problem-solving skills using AI/ML tools for design, manufacturing, thermal, and vibration-related systems.

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 fundamental AI/ML algorithms and architectures.	II	Understand
CO2	Apply data preprocessing, feature extraction, and modelling to mechanical engineering problems.	III	Applying
CO3	Analyse mechanical datasets to discover patterns and derive performance insights.	IV	Analysing
CO4	Evaluate AI/ML-based decision systems in real-time mechanical applications.	V	Evaluate

Module	**Module Contents**	**Hours**
I	**Introduction to AI/ML in Engineering:** Definition of AI, ML, and Deep Learning; Role of data and algorithms; Historical evolution; AI vs. traditional programming; Applications in mechanical systems like condition monitoring, design automation, robotics, etc.	6
II	**Supervised Learning in Mechanical Applications:** Linear/Logistic Regression, Decision Trees, SVM, k-NN; Case Studies – Predictive maintenance, performance prediction of engines, thermal systems modelling; Evaluation metrics.	7
III	**Unsupervised Learning and Clustering Techniques:** Clustering (K-means, DBSCAN), PCA, t-SNE, Anomaly Detection; Applications – Vibration analysis, Fault detection, Optimization of design variants.	6
IV	**Deep Learning for Mechanical Systems:** Clustering (K-means, DBSCAN), PCA, t-SNE, Anomaly Detection; Applications – Vibration analysis, Fault detection, Optimization of design variants.	7
V	**AI/ML in CAD, CAM, and Robotics:** Smart manufacturing, ML-based design optimization, Quality control using AI, Adaptive control in CNC, AI in autonomous robotic systems, Generative design, digital twin applications.	6
VI	**AI/ML Implementation and Integration:** Data collection from sensors, preprocessing (normalization, feature scaling), model training and deployment; Industry 4.0 case studies; Ethics and limitations of AI in mechanical systems.	7

Textbooks	
1	S. Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithm, PHI.
2	Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly, 2019.
3	D.K. Jha et al., Artificial Intelligence for Mechanical Engineers, Wiley, 2021.

References	
1	Amit Tyagi, Avinash Sharma, Khushboo Tripathi, Advanced Machine Learning: Fundamentals and algorithms
2	Yegnanarayana, B., *Artificial Neural Networks*, PHI.
3	Bishop, C.M., *Pattern Recognition and Machine Learning*, Springer.

4	Satish Kumar, *Neural Networks: A Classroom Approach*, McGraw Hill.
Useful Links	
1	https://www.nptel.ac.in/courses/112/105/112105305/ (AI in Mechanical Engineering)
2	https://www.tensorflow.org
3	https://scikit-learn.org
4	https://towardsdatascience.com
5	https://ocw.mit.edu/courses/mechanical-engineering/

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
CO2		1	2	2	1								1	
CO3		2	3		2								2	1
CO4	2		2										1	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

(Government Aided Autonomous Institute)

AY 2025-26

Course Information	
Programme	B. Tech. (Electrical Engineering)
Class, Semester	Third Year B. Tech., Sem. V (Minor Course)
Course Code	7MEL301
Course Name	Power Electronics Drives
Desired Requisites:	Fundamentals of Electrical Engineering

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

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	9
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.)	8
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	9

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)	9
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.	9
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	9
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)

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26

Course Information

Programme	B. Tech. (Electrical Engineering)
Class, Semester	Third Year B. Tech., Sem. V (Minor Course)
Course Code	7MEL302
Course Name	Industrial Automation
Desired Requisites:	NIL

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

Course Objectives

1	This course intends to develop basics of ladder logic programming for PLC.
2	It provides the foundation level knowledge of SCADA System.
3	It gives overview of various types of controller for closed loop control.
4	It provides the applications of variable speed drives in industries.

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	**Discuss** the various types of process parameters in Industrial Automation.	II	Understanding
CO2	**Compare** the various types of controllers for Industrial Automation.	II	Understanding
CO3	**Apply** the knowledge of PLC and SCADA for Industrial Automation.	III	Applying
CO4	**Explain** the use of variable speed drives for Industrial Automation.	IV	Analysing

Module	**Module Contents**	**Hours**
I	**Measurement of Various Process Parameters** Measurement of quantities such as temperature, pressure, force, displacement, speed, flow, level, humidity, pH etc., signal conditioning, estimation of errors and calibration	9
II	**Process Control and Various Controllers** Introduction to process control, PID controller and tuning, various control configurations such as cascade control, feed forward control, split range control, ratio control, override control and selective control.	8
III	**Actuators** Introduction to various actuators such as flow control valves, Hydraulic and pneumatic, servo motors, symbols and characteristics	9
IV	**PLC** Introduction to sequence control and relay ladder logic, basic PLC system, I/O modules, scan cycle, programming of timers, counters and I/O programming.	9
V	**SCADA for Industrial Automaton** Components of SCADA systems, functions, classification of SCADA, networking and communication protocols.	9
VI	**Variable Speed Drives** Role of variable speed drives in automation, DC drives, AC drives and synchronous motor drives applications of variable speed drives.	9

Textbooks	
1	John W. Webb, Ronald A. Reis *"Programmable logic controllers, principles & applications"* by PHI publication, Eastern Economic Edition.
2	C. D. Johnson*, "Process control & instrumentation techniques".* Pearson Education
References	
1	George Stephanopoulos, *"Chemical Process Control - An introduction to Theory and Practice",* Prentice-Hall of India, 1st Edition 1984.
2	*"Fundamentals of Electrical Drives",* G. K. Dubey, Narosa publication, 2nd edition.
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_me67/preview

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2024-25

Course Information

Programme	B. Tech. (Electrical Engineering)
Class, Semester	Third Year B. Tech., Sem. VI (Minor Course)
Course Code	7MEL321
Course Name	Solar and Wind Power Generation
Desired Requisites:	Power Electronics

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

Course Objectives

1	To create awareness about the importance of renewable energy technology for sustainable future.
2	Impart the knowledge of solar power generation and wind power generation.
3	To acquaint students with possible storage systems in renewable power generation.
4	Introduce recent trends in renewable energy system to students.

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	Illustrate importance, potential and harnessing technologies for various renewable energy sources.	III	Applying
CO2	Apply various technologies to harness the power from solar PV energy sources.	III	Applying
CO3	Apply various technologies to harness the power from wind energy sources.	III	Applying
CO4	Illustrate the modern trends in energy storages, fuel cells and renewable energy systems.	III	Applying

Module	**Module Contents**	**Hours**
I	**Introduction to Renewable Energy Sources** Global and Indian scenario of RES, need for alternative energy sources, advantages &disadvantages of RES, classification of RES & comparison, key factors affecting RES. **Case Study:** PM Kusum Yojana and PM Suryoday Yojana	6
II	**Solar Energy** Solar thermal power generation, solar photovoltaic power generation, basics of PV cell, materials used for PV cell, efficiency of PV cell, equivalent electrical circuit, open circuit voltage and short circuit current, I-V & P-V curves, effects of different electrical parameters on I-V & P-V curves, measurement of solar insolation, solar concentrator, flat plate &concentrating collectors.	6
III	**Solar Photovoltaic Energy Conversion & Utilization** Configuration of PV power generation system- off-grid system & grid-connected PV system, single stage & two stage converters for power transfer, single phase & three phase inverters for PV, control of grid connected PV system, **Net Metring:** working, application in grid connected PV system and benefits.	7

IV	**Wind Resource Assessment** Power available in wind, wind turbine power & torque characteristics, types of rotors, characteristics of wind rotor, local effects, wind shear, turbulence & acceleration effects, measurement of wind, wind speed statistics, statistical model for wind data analysis, energy estimation of wind regimes, capacity factor, aerodynamics of wind turbines, aerofoil, lift & drag characteristics, power coefficient & tip speed ratio characteristics, electrical generator machines in wind energy systems. Control of Grid connected wind power generation systems Maximum power point tracking of wind power generation	7
V	**Storage and Fuel Cell Technologies** Introduction, need for storage for RES, traditional energy storage system- battery, fuel cell, principle of operation, types of fuel cell, hydrogen generation methods, storage technologies.	6
VI	**Emerging Trends in Renewable Energy** Introduction to Smart Grid (SG), SG in Indian context, architecture of SG, advantages &disadvantages, key challenges for SG, SG technologies, AMI, PMU, WAMS, standards & codes for grid integration of Distributed Generation systems.	7

Textbooks	
1	Chetan Singh Solanki, "*Solar Photovoltaics , Fundamentals, Technologies and Applications*" , third edition, PHI Learning Private Limited , 2016
2	S. P. Sukhatme and J. K. Nayak "Solar *Energy principles of thermal collection and storage",* Third Edition, McGraw Hill Education (India) Private Limited New Delhi. , 2016
3	Boyle, Godfrey, "*Renewable Energy*", 2nd edition, Oxford University Press, 2004.
4	G.S.Sawhney, "*Non-Conventional Resources of Energy*", PHI Publication 2012
References	
1	Gary-L. Johnson, "*Wind Energy Systems*", Tata Mc-Graw-Hill Book Company.
2	James Manwell, J. F. Manwell , "*Wind Energy Explained: Theory, Design and Application*"
3	Paul Gipe Wind Power, "*Renewable Energy for Home, Farm, and Business*."
Useful Links	
1	https://nptel.ac.in/courses/117/108/117108141/
2	https://onlinecourses.nptel.ac.in/noc20_mm05/preview
3	https://www.helioscope.com/

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	1											2	
CO3	3	1											2	
CO4	3												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 canbe 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. (Electrical Engineering)
Class, Semester	Third Year B. Tech., Sem. VI (Minor Course)
Course Code	7MEL371
Course Name	Mini-Project
Desired Requisites:	

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

Course Objectives

1	To acquire the skills of electrical and electronic circuit design and assembly.
2	To develop the skills of analysis and fault diagnosis of the electrical and electronic circuit as per design
3	To test the electrical and electronic circuit assembly

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 basics concepts used in Mini Project.	III	Understanding
CO2	Analyse and infer the reference literature critically and efficiently.	IV	Analysing
CO3	Construct the model of the project	VI	Creating
CO4	Evaluate the performance of the project.	V	Evaluating
CO5	Write and Present the report of the project.	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Visit to a local industry or search for the study of problems of industry.
2. Prepare the problem based hardware Mini project.
3. Evaluate the performance of project.
4. Prepare a report on the same.

Note :
Student will have to perform a group project based on above points which will be evaluated as In Semester Examination (LA1, LA2 and Lab ESE).

Textbooks

References

1	

Useful Links

1	

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		3							3					
CO3	1		3											
CO4				2	3									
CO5									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.				

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	Second Year B. Tech., Sem.-IV
Course Code	7MEN221
Course Name	Electronic Devices and circuits
Desired Requisites:	Analog Electronics

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

Course Objectives

1	To **explain** the working of electronic circuits: small signal amplifiers using BJT and MOSFETs, feedback amplifiers and voltage regulators.
2	To **illustrate** the small signal models used for analysis of electronic circuits.
3	To **explain** the working of oscillators and multivibrators.
4	To **illustrate** the methods of designing the electronic circuits using discrete components.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	**Apply** the fundamentals of circuit theory to calculate AC/DC conditions of amplifiers.	Applying
CO2	**Analyze** the performance of electronic circuits (amplifiers) using small signal models such as hybrid-$\boldsymbol{\pi}$, $\boldsymbol{r_e}$ and ***h***-parameter model.	Analyzing
CO3	**Evaluate** the performance power amplifiers, feedback amplifiers, oscillators and multivibrators.	Evaluating
CO4	**Design** the electronic circuits (amplifiers) for given specifications using discrete components such as BJT, FET and MOSFET.	Creating

Module	**Module Contents**	**Hours**
I	**Small Signal Amplifiers:** Biasing Methods for BJT, JFET and MOSFET amplifiers, DC and AC load line analysis, small signal hybrid-π model, small signal equivalent circuit, analysis of common emitter (CE), common collector (emitter follower) amplifier and common base (CB) amplifier; analysis of common emitter (CS), common drain (source follower) amplifier and common gate (CG) amplifier.	**7**
II	**Power Amplifiers:** Classification of power amplifiers: class-A, class-B, class-AB, class-C power amplifiers; transformer-coupled amplifiers, class-AB push-pull complementary output stage.	**7**
III	**Frequency Response of Amplifiers:** Amplifier frequency response, square wave testing, effect of coupling, bypass, junction and stray capacitances, Low frequency and high frequency response of common emitter (CE) and common source (CS) amplifiers considering high frequency models of BJT and MOSFET.	**7**

IV	**Feedback Amplifiers:** Multistage amplifiers, Darlington pair, feedback concept, amplifiers with negative feedback, effects of negative feedback, four basic feedback topologies; Oscillators: basic principle of oscillation, Phase-Shift oscillator	**6**
V	**Oscillators and Multivibrators:** Principle of Positive feedback, Barkhausen criteria for oscillation, RC and LC oscillators; Multivibrators: Astable, Monostable and Bistable Multivibrator, Schmitt trigger circuit.	**6**
VI	**Voltage Regulators:** Series and shunt voltage regulators, design of Zener diode voltage regulator.	**6**

Textbooks	
1	D. A. Neamen, "Electronic Circuit Design and Analysis", 3rd Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2007.
2	D. A. Neamen, "*Microelectronics: Circuit Analysis and Design*", 4th Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2021.
3	A. S. Sedra and K. C. Smith, "Microelectronic Circuits", 5th Edition, Oxford University Press, 2004.
4	Allen Mottershead, "*Electronic Devices and Circuits*", 2nd Edition, PHI, 1979.
References	
1	R. Boylestad and L. Nashelsky, "*Electronic Devices and Circuit Theory*", 9th Edition, PHI, 2009.
2	Millman and Halkias, "*Electronic devices and Circuits: An Introduction*", 1st Edition, Tata McGraw Hill, 1991.
3	Jacob Millman, Herbert Taub, "Pulse, Digital and Switching Waveforms", 2nd Edition, Tata McGraw –Hill Publishing Company Ltd., New Delhi, 2007.
Useful Links	
1	https://nptel.ac.in/courses/108105158
2	https://nptel.ac.in/courses/117101106
3	https://nptel.ac.in/courses/108101091

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)

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	Third Year, B.Tech., Sem. III
Course Code	7MEN301
Course Name	Digital Electronics System
Desired Requisites:	Digital Electronics

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

Course Objectives

1	To develop the fundamental concepts in digital design.
2	To make differences between combinational and sequential circuits evident to students.
3	To motivate students, learn implementation of digital circuits using HDL and PLD.
4	To teach students to develop digital design using VHDL code

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Differentiate between combinational and sequential circuits	Compare
CO2	Design medium scale combinational and sequential digital circuits	Construct
CO3	Utilize the architecture and organization of microprocessors with instruction set to design assembly language programs	Apply
CO4	Differentiate between PAL, PLA, PLD and their architecture.	Compare

Module	**Module Contents**	**Hours**
I	**Combinational Logic I:** Review of Digital circuits, Code converter, Quine: Mc-cluskey method for logic minimization, Designs using MUX and Demux,	7
II	**Combinational Logic II:** Priority Encoder, Priority decoder, Parity Generator and Checker, Carry look ahead adder, ALU , tristate buffers, Hazards,. Hazard removal,	7
III	**Sequential Logic:** Characteristics equations of F/F,Conversion of any FF to any other FF, , Switch Denouncing, Counters.	7
IV	**Shift register**: shift resistor, Bidirectional shift resistor, universal shift register, Johnson counter, universal shift resistor, Ring Counter. twisted ring counters, Timing parameters. Clock Skew, Clock jitter, Meta stability	6
V	**Finite state machines:** State diagram, State assignment, Clocked Synchronous State Machines Design using J-K, D, T FF, State reduction	6
VI	1.**Programmable Logic Devices**: Design Using PLA & PAL, CPLD architectures **Logic Families:** TTL,CMOS, and their characteristics	6

Textbooks

1	"Digital Design", John F. Wakerly,Pearson Education Publication,
2	"Fundamentals of Digital Circuits", Anand Kumar, PHI, 2ndEdition, 2016.
3	"Digital Electronics" Mandal S.K , 1st Ediction. Mc-Graw-Hill
4	"VHDL-Programming by Example" Douglas Perry TMH, 4th Edition

5	"Microprocessor Architecture, Programming and Applications with the 8085 " Ramesh Gaonkar, Penram 6th Edition
References	
1	"Modern Digital Design", R..P.Jain, Mc-Graw-Hill
2	"Digital Logic and Computer Design", Morris Manno, PHI
3	
4	
Useful Links	
1	https://nptel.ac.in/courses/108/105/108105113
2	https://nptel.ac.in/courses/117/106/117106086
3	
4	

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26

Course Information

Programme	B. Tech. (Electronics Engineering)
Class, Semester	Third Year, B.Tech., Sem. VI
Course Code	7MEN321
Course Name	Microprocessors and Microcontrollers
Desired Requisites:	Digital Electronics, C Programming

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 difference between microprocessor and microcontroller.
2	To explain Intel 8051 microcontroller and its programming in assembly and 8051 C language.
3	To explain interfacing of external devices with Intel 8051 and 8051 C programming.
4	To explain design and development of microcontroller based applications / systems.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	**Illustrate** the architecture of Microcontroller in comparison with Microprocessor.	Apply
CO2	**Demonstrate** situation-based interfacing of external devices with Intel 8051.	Apply
CO3	**Write** assembly and C language programs for Intel 8051 to meet given system requirements.	Analyze
CO4	**Design** 8051 microcontroller-based applications / systems.	Create

Module	**Module Contents**	**Hours**
I	**Microprocessors:** CPU organization, Introduction to 8-bit microprocessor architecture, internal architecture, assembly language programming, instructions.	7
II	**Microprocessor vs. Microcontroller** Introduction of Microprocessor and Microcontroller; Block diagram, function of each pin of 8051; Architectural difference between microprocessor and microcontroller; features and applications of 8051.	7
III	**Microcontroller Programming** Microcontroller Programming basics; 8051 assembly language programming; Instruction set; Instruction types; Addressing modes; 8051 C programming; Features and advantages of 8051 C programming; Programming examples for both; Use of Development tools for Intel 8051.	7
IV	**External Peripheral Interfacing** Port structure of 8051; Interfacing led and switch with 8051; Interfacing devices like relay, DC motor, Stepper motor, seven segment display, character LCD, DAC0808, digital sensors, analogue sensors through ADC0808; External memory interface; Writing algorithm and program for interfaces.	6

V	**Internal Peripherals** 8051 Timer and its working, Timer modes, Programming timer as timer in C, Programming timer as counter in C; 8051 UART and its working, Serial communication modes, Programming UART in C; 8051 Interrupts sources, Interrupt flags, Vector addresses, Interrupt structure, Interrupt blocking conditions, Interrupt priorities, Interrupt latency, Interrupt configuration, Writing an Interrupt Service Routine in C.	6
VI	**Microcontroller Based System Design** System requirements; Selection of components; Interface design; Flow chart design; Writing Algorithm; Writing C program for system; Creating libraries; Microcontroller based application / system design using internal and external peripherals. Introduction to Arduino, Setup computer to use Arduino, Arduino Libraries, Arduino Based Systems Design	6

Textbooks	
1	Kenneth J. Ayala, The 8051 Microcontroller Architecture, Programming and Applications, 2nd Edition, Penram International Publication, revised edition 2009
2	Mohammad Ali Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education, 2nd edition, 2010.
3	Ramesh Gaonkar, Fundamentals of Microcontrollers and Applications in Embedded Systems, Penram International Publication(India), 2010
4	Michael Margolis, Arduino Cookbook, O'Reilly Publications 2020

References	
1	Intel 8051 datasheet (www.intel.com)
2	Keil A51 and C51 manuals
3	Hi-Tech C Compiler manual
4	Massimo Banzi, Michael Shiloh, Getting Started with Arduino, Shroff/Maker Media 2014

Useful Links	
1	https://nptel.ac.in/
2	https://in.coursera.org/
3	https://www.tutorialspoint.com/
4	https://www.javatpoint.com/

CO-PO Mapping

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

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, mini task, regular tests 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. (Electronics Engineering)
Class, Semester	Third Year B. Tech., Sem.-VI
Course Code	7MEN371
Course Name	MDM Lab
Desired Requisites:	Analog Electronics, C Programming Lab

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

Course Objectives

1	To **explain** the working of electronic circuits like rectifiers, amplifiers (voltage and current), power amplifiers and feedback amplifiers using BJT, FET and MOSFETs.
2	To **illustrate** the methods of designing the electronic circuits using discrete components.
3	Able to implement on kits or on simulator.
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	**Demonstrate** the working of electronic circuits: small signal amplifiers built using BJT, JFET and MOSFET, feedback amplifiers and voltage regulators.	Applying
CO2	**Test** and **analyses** the performance of amplifiers built using BJT, JFET and MOSFET.	Analyzing
CO3	To Evaluate the complete flow of EDA tool for implementing digital designs	Evaluating
CO4	To Design and debug of an assembly and 8051 C program for 8051 microcontrollers in KEIL MICROVISION C51 IDE	Creating

List of Experiments / Lab Activities/Topics

List of Topics (Applicable for Interaction mode):

List of Lab Activities: (Minimum 08 experiments)

2. Design and analysis of single stage common emitter BJT amplifier. Plot the frequency response of amplifier.
3. Design and analysis of common collector (emitter follower) amplifier.
4. Design and analysis of common source JFET amplifier.
5. 1 bit full adder using 1 bit half adder as a component
6. Implementation of flip flops
7. UP counter and DOWN counter
8. Assembly language programs to perform different operations, implement if else, for loop, while loop,
9. logic gates and to study block transfer
10. 8051 C program for LED blinking and operating LED using SWITCH
11. Interfacing Motor, BULB etc. with 8051 microcontroller
12. Interfacing 4 digits Multiplexed Display with 8051 microcontroller

Textbooks

1	John F. Wakerly, "Digital Design", Pearson Education Publication, 5th edition, 2018.
2	Kenneth J. Ayala, The 8051 Microcontroller Architecture, Programming and Applications, 2nd Edition, Penram International Publication, revised edition 2009
3	D. A. Neamen, "*Electronic Circuit Design and Analysis*", 3rd Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2007.
4	A. S. Sedra and K. C. Smith, "*Microelectronic Circuits*", 5th Edition, Oxford University Press, 2004.

References

1	R.P.Jain, "Modern Digital Design", Mc-Graw-Hill, 4th edition, 2010
2	Intel 8051 datasheet (www.intel.com)
3	2 Keil A51 and C51 manuals
4	R. Boylestad and L. Nashelsky, "*Electronic Devices and Circuit Theory*", 9th Edition, PHI, 2009.

Useful Links

1	https://nptel.ac.in/courses/122106025

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										2
CO3					2									2
CO4				2										2

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High
Each CO of the course must map to at least one PO, 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. (Electronics Engineering)
Class, Semester	Final Year, B.Tech., Sem. VII
Course Code	7MEN401
Course Name	Communication Engineering
Desired Requisites:	Basic Electronics Engineering, Engineering Mathematics

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 the techniques of transmitting and receiving information signals using analog and carrier modulation techniques and evaluate their performance levels (SNR) in the presence of channel noise.
2	To establish foundation for understanding the relationship among various technical factors useful for designing communication system.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Define various fundamental aspects of the communication systems.	Remember
CO2	Understand various modulation & demodulation techniques used in communication systems.	Understand
CO3	Interpret various radio transmitter & receiver circuits and different types of noise in communication systems.	Apply
CO4	Analyse various parameters such as modulation index, channel capacity, transmission efficiency, S/N ratio etc. used in communication systems.	Analyse

Module	**Module Contents**	**Hours**
I	**Amplitude Modulation and Demodulation** DSB-FC, DSB-SC, SSB, VSB and ISB transmissions: mathematical Analysistime and frequency domain analysis, modulation index, generation and detection methods, power requirement of these systems, Comparison of AM modulation schemes, Quadrature Carrier Multiplexing (QAM), frequency division Multiplexing, AM detection: envelope detection, Demodulation of DSBSC: synchronous detection	7
II	**Frequency Modulation and Demodulation** Frequency Modulation (FM),: Single Tone Frequency Modulation, Spectrum Analysis, Narrowband FM, Wideband FM, Transmission Bandwidth of FM Waves, Generation of FM waves: Direct and Indirect Methods, Demodulation of FM, Phase Locked Loops, Limiting of FM waves, comparison between AM & FM, Phase Modulation, Relation between FM and PM	7
III	**Sampling theorem and Pulse Modulation Techniques** Sampling theorem, Types of sampling, Inter symbol interferences, Modulation & Demodulation of PAM, PWM, PPM, merits & demerits, Introduction to PCM system, quantization of signals, Differential PCM, Delta Modulation, Adaptive Delta Modulation.	7

IV	**Digital Data Transmission** Definition of Line Coding, various line codes, unipolar, bipolar RZ and NRZ techniques, split phase Manchester formats	6
V	**Digital Modulation Techniques** Coherent Quadrature Modulation Techniques, Non-Coherent Binary Modulation Techniques, Comparison of Binary and Quaternary Modulation Techniques; M array modulation Techniques, Power spectra, Bandwidth efficiency, M array Modulation formats Viewed in the light of channel Capacity theorem, Effect of inters symbol interference.	6
VI	**Noise** Classification and sources of noise, signal to noise ratio (SNR), noise analysis and measurements, equivalent noise bandwidth, noise figure, noise temperature, AWGN.	6

Textbooks	
1	T.L. Singal, "Analog and Digital Communication",6th Edition, Mc Graw Hill, 2012
2	Roy Blake, "Electronic Communication System", Thomson Publications, 2nd Edition,2002
3	Taub Schilling, "Principle of communication system", TMH publication, 4th Edition, 2013
4	

References	
1	Simon Hykin, "Communication System", 4th Edition, John Wiley & Sons, 2000
2	B. P. Lathi, "Modern Digital and Analog Communication Systems", Oxford Publications, 3rd Edition, 1998
3	George Kennedy, "Electronic Communication System", McGraw Hill, 4th Edition, 2009
4	

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										3	
CO3			2										2	
CO4			3										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. (Electronics and Communication Engineering)
Class, Semester	Final Year, B.Tech., Sem. VII
Course Code	7MEN402
Course Name	Automotive Electronics
Desired Requisites:	Electronic Devices

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

Course Objectives

1	To learn the basic control system and sensor required Engine control
2	To learn basic of signal conversion circuit in Automotive system
3	To enhance skill of communication in automotive vehicle
4	To explore advances in Automotive industry

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Understand the importance of fuel economy and government rules in automotive industry	Understand
CO2	Use various sensor system to control engine and its devices	Understand
CO3	Apply knowledge of communication to device for controlling devices	Apply
CO4	Analyse a problem and identify the computing requirements for engine control instrumentation	Analyze

Module	**Module Contents**	**Hours**
I	**Module 1: The Basics of Electronic Engine Control** Motivation for Electronic Engine Control. Exhaust Emissions, Fuel Economy, Federal Government Test Procedures, Concept of an Electronic Engine Control System, Definition of Engine Performance Terms, Exhaust Catalytic Converters, Electronic Fuel Control System, Analysis of Intake Manifold Pressure, Idle Speed Control, Electronic Ignition	7
II	**Module 2: Sensors and Actuators** Automotive Control System Applications of Sensors and Actuators, Throttle Angle Sensor, Temperature Sensors, Typical Coolant Sensor, Sensors for Feedback Control, Knock Sensors, Angular Rate Sensor, LIDAR, Digital Video Camera, Flex-Fuel Sensor, Automotive Engine Control Actuators, Variable Valve Timing, Electric Motor Actuators, Stepper Motors, Ignition System	7
III	**Module 3: Digital Powertrain Control Systems** Digital Engine Control, Control Modes for Fuel Control, Discrete Time Idle Speed Control, EGR Control, Variable Valve Timing Control, Turbocharging, Direct Fuel Injection, Flex Fuel, Electronic Ignition Control, Integrated Engine Control System, Summary of Control Modes	7

IV	**Module 4: Vehicle Motion Controls** Representative Cruise Control System, Cruise Control Electronics, Antilock Braking System, Electronic Suspension System, Electronic Suspension Control System, Four-Wheel Steering CAR	6
V	**Module 5: Automotive Instrumentation** Modern Automotive Instrumentation, Input and Output Signal Conversion, Display Devices, Fuel Quantity Measurement, Coolant Temperature Measurement, Oil Pressure Measurement, Vehicle Speed Measurement,	6
VI	**Module 6: Vehicle Communications** IVN, CAN, Local Interconnect Network (LIN), FlexRay IVN, MOST IVN, Vehicle to Infrastructure Communication, Vehicle-to-Cellular Infrastructure, Short-Range Wireless Communications, Satellite Vehicle Communication, GPS Navigation, Safety Aspects of Vehicle-to-Infrastructure Communication	6

Textbooks	
1	*Understanding Automotive Electronics an Engineering Perspective by* William Ribbens, Elsevier
2	Bosch Automotive Electrics and Automotive Electronics: Systems and Components, Networking and Hybrid Drive, Robert Bosch GmbH, Springer Science & Business Media, 2013

References	
1	Automotive Electronics Design Fundamentals, Najamuz Zaman, Springer Cham, October 2016
2	Automotive Electronics Handbook, Ronald K. Jurgen, McGraw Hill Professional, 1999

Useful Links	
1	https://en.wikipedia.org/

CO-PO Mapping

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26

Course Information	
Programme	B. Tech. (Electronics Engineering)
Class, Semester	Final Year, B.Tech., Sem. VII
Course Code	7MEN445
Course Name	Mini Project
Desired Requisites:	ECAD-I, ECAD-II, Digital Signal Processing, Embedded System Design, Digital Signal Processing

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

Course Objectives

1	To provide students hands on experience on, troubleshooting, maintenance, fabrication, innovation, record keeping, documentation etc. thereby enhancing the skill and competency part of technical education.
2	To create an Industrial environment and culture within the institution.
3	To inculcate innovative thinking and practice-based learning and thereby preparing students for their final year project.
4	To set up self-maintenance cell within departments to ensure optimal usage of infrastructure Facilities.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Choose, Initiate and manage a minor project.	Understand
CO2	Propose research problem and present it in a clear and distinct manner through different oral, written and design techniques.	Apply
CO3	Construct the circuit using hardware and/or software.	Create
CO4	Execute the project and comment upon the results of it.	Analyze

List of Experiments / Lab Activities/ Topics

Mini Project Description:

A project group shall consist of normally 3 students per group. The mini project will involve the design, construction, and debugging of an electronic system approved by the department. Each student should conceive, design and develop the idea leading to a project/product. **The theme of the project should be related to electronics engineering discipline to be decided by the students based on the societal needs after an exhaustive survey.**

Each student must keep a project notebook/logbook. The project notebooks will be checked periodically throughout the semester, as part of in-semester-evaluation. The student should submit a soft bound report at the end of the semester. The final product as a result of mini project should be demonstrated at the time of examination.

Textbooks

1	Electronics Projects For Dummies, by by Earl Boysen and Nancy Muir, Published by Wiley Publishing, Inc., 2006
2	Make: Electronics, by Charles Platt, Published by Maker Media, 2015

References	
1	A. E. Ward, J.A.S. Angus, “Electronic Product Design”, Stanley Thrones (Publishers) Limited, 1996.
2	Paul Horowitz, Winfield Hill, “The Art of Electronics”, Cambridge University Press, 1989

CO-PO Mapping

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26

Course Information

Programme	B.Tech. (Computer Science and Engineering - Minor)
Class, Semester	Third Year B. Tech., Sem (V)
Course Code	7MCS301
Course Name	Introduction to Cryptography
Desired Requisites:	

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

Course Objectives

1	To explore modern symmetric and asymmetric cryptographic techniques
2	To understand cryptanalysis and key management schemes
3	To evaluate security protocols and algorithms
4	To apply cryptography in real-world systems like blockchain, secure computation, etc.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	**Course Outcome Statement/s**	**Bloom's Taxonomy Level**	**Bloom's Taxonomy Description**
CO1	Explain modern cryptographic principles and algorithms	II	Understand
CO2	Apply cryptographic algorithms for data confidentiality and integrity	III	Apply
CO3	Analyze security of cryptographic schemes and protocols	IV	Analyze
CO4	Design secure systems using advanced cryptographic methods	VI	Create

Module	**Module Contents**	**Hours**
I	Review of Classical Cryptography, Perfect Secrecy, Shannon Theory	6
II	Block Ciphers – AES, Modes of Operation	6
III	Public Key Cryptography – RSA, ElGamal, Key Distribution	7
IV	Cryptographic Hash Functions, MACs, Digital Signatures	7
V	Zero Knowledge Proofs, Secret Sharing, Elliptic Curve Cryptography	7
VI	Applications in Blockchain, Homomorphic Encryption, Post-Quantum Cryptography	6

Textbooks

1	William Stallings, *Cryptography and Network Security*, Pearson
2	Paar & Pelzl, *Understanding Cryptography*, Springer
3	Katz & Lindell, *Introduction to Modern Cryptography*, CRC Press

References

1	Menezes et al., *Handbook of Applied Cryptography*
2	Boneh & Shoup, *A Graduate Course in Applied Cryptography*

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)

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26

Course Information

Programme	B.Tech. (Computer Science Engineering - Minor)
Class, Semester	Third Year B. Tech., Sem V
Course Code	7MCS351
Course Name	Introduction to Cryptography Lab
Desired Requisites:	

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 implement cryptographic algorithms
2	To analyze algorithm performance and security
3	To apply cryptography in secure communications
4	To experiment with modern cryptographic frameworks

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	Implement symmetric and asymmetric algorithms	III	Apply
CO2	Analyze cryptographic protocols for vulnerabilities	IV	Analyse
CO3	Use cryptographic libraries and tools and evaluate the methods	V	Evaluate
CO4	Develop applications incorporating secure communication	VI	Create

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Implement AES, DES in Python
2. RSA key generation and encryption
3. Digital Signature algorithm
4. Diffie-Hellman key exchange
5. Hashing with SHA-256
6. Using OpenSSL/GnuPG for encryption
7. Elliptic Curve Cryptography demo
8. Zero-Knowledge proof (simulated)
9. Blockchain-based transaction signing
10. Mini project on Secure Messaging

Textbooks

1	Paar & Pelzl, *Understanding Cryptography*
2	William Stallings, *Cryptography and Network Security*

References

1	OpenSSL documentation
2	GPG Manual

Useful Links

2	https://cryptopals.com
3	https://www.openssl.org

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26

Course Information	
Programme	B.Tech. (Computer Science and Engineering - Minor)
Class, Semester	Third Year B. Tech., Sem (V/VI)
Course Code	7MCS321
Course Name	Introduction to Blockchain
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	1000
		Credits: 3			

Course Objectives	
1	To understand the technology behind block chain
2	To gain the knowledge of emerging trends in block chain
3	To handle the Real-world applications of block chain.

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	Identify the importance of Blockchain technology	I	Remembering
CO2	Interpret the fundamentals and basic concepts in Blockchain	II	Understanding
CO3	Summarize the requirements of the basic design of blockchain.	II	Understanding
CO4	Compare the working of different blockchain platforms	IV	Analyzing

Module	**Module Contents**	**Hours**
I	Introduction to Blockchain & Cryptography: Basic ideas behind Blockchain, Evolution and its role in digital transformation, Introduction to cryptographic concepts, Hashing and Hash Puzzles, Public Key Cryptosystems, Difference between Public and Private Blockchain, Blockchain Use Cases	7
II	Blockchain Architecture and Terminologies: Basic architecture of Blockchain, Key terminologies: Node, Miner, Ledger, Consensus, Block, Chain, etc. , Characteristics of Blockchain, Types of networks: Public, Private, Consortium, Introduction to Smart Contracts	7
III	Core Components and Protocols: Core components of Blockchain: Nodes, Blocks, Hash, Ledger, Wallet, etc. , Blockchain Protocols overview, Permissioned vs Permissionless Blockchains, Types of Blockchains	6
IV	Digital Ledger Technologies (DLT): Short history of Money and Trust , Bitcoin: Working Mechanics and Architecture, Ethereum: Overview and Smart Contract Capabilities, Hyperledger: Introduction, Hyperledger Fabric Architecture , Hyperledger Composer	7
V	Blockchain Tools and Platforms: Overview of popular Blockchain platforms, Geth (Go-Ethereum Client). Ripple , Stellar, R3 Corda, Blockchain APIs, Blockchain Sandboxes	6

VI	Emerging Trends and Future of Blockchain: Cloud-based Blockchain solutions, MultiChain, Blockchain-as-a-Service (BaaS), Integration with other technologies (AI, IoT, Cloud), Challenges and future scope of Blockchain Technology	6

Textbooks	
1	Artemis Caro, "Blockchain: The Beginners Guide to Understanding the Technology Behind Bitcoin & Crypto currency".
2	Scott Marks, "Blockchain for Beginners: Guide to Understanding the Foundation and Basics of the Revolutionary Blockchain Technology", Create Space Independent Publishing Platform
References	
1	Mark Watney, "Blockchain for Beginners".
2	Alwyn Bishop, "Blockchain Technology Explained".
Useful Links	
1	NPTEL Course "Introduction to Blockchain Technology & Applications" https://nptel.ac.in/courses/106/104/106104220/
2	NPTEL Course "Introduction to Blockchain Technology & Applications" https://nptel.ac.in/courses/106/104/106104220/

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								
CO2	2	2			1									
CO3	2	2	1		1									
CO4	1	3	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)

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26

Course Information

Programme	B.Tech. (Computer Science Engineering - Minnor)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	7MCS371
Course Name	Introduction to Blockchain Lab
Desired Requisites:	

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

Course Objectives

1	To understand and apply core cryptographic techniques and blockchain principles
2	To design, develop, and deploy smart contracts and distributed ledger applications
3	To explore and experiment with emerging blockchain tools, platforms, and APIs

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	Implement cryptographic algorithms and simulate blockchain mechanisms like hashing and proof of work.	III	Applying
CO2	Develop and deploy smart contracts using Ethereum-based platforms such as Remix IDE and MetaMask.	IV	Analyzing
CO3	Configure and demonstrate permissioned blockchain networks using tools like Hyperledger Fabric and Geth.	V	Evaluating
CO4	Integrate blockchain with modern platforms and APIs for real-world applications, including cloud and web services.	VI	Creating

List of Experiments / Lab Activities/Topics

List of Lab Activities:

1. Implement SHA-256 and Keccak (SHA3) hashing algorithms
2. Implement a basic asymmetric encryption/decryption using RSA
3. Simulate a basic blockchain structure
4. Demonstrate a simple Proof of Work (PoW) mechanism
5. Setup a private Ethereum blockchain using Geth
6. Configure permissioned and permissionless blockchain environments
7. Create and deploy a smart contract on Ethereum using Remix IDE
8. Setup Hyperledger Fabric network and install a sample chaincode
9. Use MetaMask with Remix for transaction simulation
10. Explore Ripple or Stellar test network for cross-border payment simulation
11. Deploy a blockchain node on cloud (e.g., using AWS/GCP)
12. Interact with Blockchain API or sandbox

Textbooks

1	"Mastering Blockchain" *By Imran Bashir* Covers: Cryptography, Blockchain architecture, Smart contracts, Ethereum, Hyperledger, Consensus, Emerging platforms.
2	"Blockchain Applications: A Hands-On Approach" *By Arshdeep Bahga and Vijay Madisetti*

References	
1	"Blockchain Technology and Applications" *By Sandeep Saxena and Ashutosh Kumar Singh*
2	"Blockchain Enabled Applications" By Vikram Dhillon, David Metcalf, Max Hooper
Useful Links	
2	https://geth.ethereum.org/docs
3	https://www.multichain.com/developers/

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

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2025-26

Course Information

Programme	B.Tech. (Computer Science Engineering - Minor)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	7MCS345
Course Name	Seminar
Desired Requisites:	

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

Course Objectives

1	To enhance students' skills in research, analysis, and presentation.
2	To enable students to explore emerging areas in Computer Science.
3	To develop the ability to review literature and structure technical arguments.
4	To improve technical writing and communication skills.

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	Plan and structure a technical seminar with appropriate tools	III	Apply
CO2	Conduct literature survey in selected/emerging topic areas	IV	Analyse
CO3	Deliver effective oral presentations with clarity and confidence	V	Evaluate
CO4	Prepare a structured seminar report in professional format	VI	Create

List of Experiments / Lab Activities/Topics

List of Lab Activities: (in a team of 3 to 4)

1. Topic selection in consultation with faculty guide
2. Background study and literature survey
3. Weekly reviews and progress tracking
4. Annotated bibliography and research mapping
5. Mid-semester presentation and peer feedback
6. Final seminar presentation with Q&A
7. Preparation of technical report (IEEE/ACM format)
8. Evaluation by panel (guide + faculty members)
9. Submission of final report
10. Reflective summary and self-assessment

Textbooks

1	Nelson, Phillips, Steuart, *Guide to Computer Forensics and Investigations*, Cengage Learning.
2	Kruse, Heiser, *Computer Forensics: Incident Response Essentials*, Addison-Wesley.
3	Brian Carrier, *File System Forensic Analysis*, Addison-Wesley.

References

1	Eoghan Casey, Digital Evidence and Computer Crime, Academic Press.

Useful Links

1	https://www.autopsy.com
2	https://www.sleuthkit.org

3	https://www.volatilityfoundation.org

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

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 V (Minor 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

(Government Aided Autonomous Institute)

AY 2025-26

Course Information	
Programme	B.Tech. (Information Technology)
Class, Semester	Third Year B. Tech., Sem V (Minor 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 (Minor 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)