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

AY 2021-22

Course Information

Programme	M. Tech. (Electronics Engineering)
Class, Semester	First Year M. Tech., Semester I
Course Code	5EN501
Course Name	FPGA based system design
Desired Requisites:	Digital Electronics, VLSI Design, Microcontroller

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives

1	Understand Digital system design using HDL.
2	Know FPGA architecture, interconnect and technologies.
3	Know different FPGA's and implementation methodologies.
4	Configuring and implementing digital embedded system, microcontrollers, Microprocessors, DSP algorithm on FPGA.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	**Compare** various types of FPGA architectures with justification	Understand
CO2	**Develop** finite state machines for various applications.	Apply
CO3	**Analyze** the embedded systems before the actual product is developed.	Analyze
CO4	**Design** and **develop** embedded system using EDA tools.	Create

Module	**Module Contents**	**Hours**
I	**VLSI Design overview** Digital system design options and trade-offs, High Level System Architecture and Specification, FPGA Architectural options,	6
II	**Hardware description Language:** Behavioural modelling and simulation, Hardware description languages, combinational and sequential design, state machine design, test benches	6
III	**Logic block architecture:** FPGA logic cells, timing models, power dissipation I/O block architecture: Input and Output cell characteristics, clock input, Timing, Power dissipation	7
IV	**Simulation/implementation exercises:** Fast arithmetic logic blocks (Adders, Multipliers, ALUs), Data path controller architecture, Scheduling and Allocation, Pipelining	7
V	**Memory unit:** ROM, SRAM, DRAM, Virtual Memory, Cache memories, Paging, Memory organization	7
VI	**Applications:** Embedded system design using FPGAs, DSP using FPGAs, application case studies.	6

Text Books	
1	FPGA Based Digital Design : Wayne Wolf, Pentice Hall, 2012
2	
References	
1	Digital System Design using VHDL, Charles H. Roth, PWS Publishing, a branch of Thomson Learning
2	Clive Maxfield, “The Design Warriors’s Guide to FPGAs”, Elsevier, 2004.
3	Digital System Design using VHDL, Charles H. Roth, PWS Publishing, a branch of Thomson Learning
4	FPGA product catalog from Xilinx and Altera
Useful Links	
1	https://nptel.ac.in/
2	https://www.coursera.org/
3	https://forums.xilinx.com/
4	

CO-PO Mapping															
	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1			2												
CO2	2														
CO3				2											
CO4			2			2							1	1	
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.															

Assessment Plan based on Bloom’s Taxonomy Level				
Bloom’s Taxonomy Level	**T1**	**T2**	**ESE**	**Total**
Remember				
Understand	20		20	**40**
Apply		10	20	**30**
Analyze		10	20	**30**
Evaluate				
Create				
Total	**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*	
AY 2021-22	
Course Information	
Programme	M.Tech. (Electronics Engineering)
Class, Semester	First Year M.Tech., Sem I
Course Code	5EN502

Course Name	Embedded System Design				
Desired Requisites:	Microprocessors / Microcontrollers				
Teaching Scheme	**Examination Scheme (Marks)**				
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-	Nil			
Interaction	-	**Credits: 3**			

Course Objectives	
1	Understand ARM processor core architecture with several features of peripherals available on various embedded Cortex- M processors
2	Understand interrupts and its programming with peripherals
3	Develop small embedded system by using the ARM processor core based systems and application software for it
4	Use EDA tools to design embedded system PCB.
5	Interface various memories with cortex M processor

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	**Illustrate** Cortex M3 / M4 processor architecture and its features	Underst and
CO2	**Apply** programming skills to develop algorithm for peripherals and interrupts	Apply
CO3	**Develop** embedded system software.	Create
CO4	**Design** and develop embedded systems based applications	Create

Module	Module Contents	Hours
I	**ARM Cortex –M Architecture and Programming** ARM Cortex M3/M4 Architecture, Registers, CPU status, Clock generation, Memory organization, Instruction Set, Programming model – Registers, Operation Modes, Embedded C Programming	6
II	**Cortex M CPU Interrupts** Nested Vectored Interrupt Controller (NVIC), Vector table, Interrupt priorities, Interrupt Inputs and Pending behaviour, Fault Exceptions, Supervisor and Pendable Service Call, SYSTICK Timer, Interrupt Sequences, Exits, Tail Chaining, Interrupt Latency, Start-up files, initialization of peripherals interrupts, Interrupt routines programming	6
III	**ARM Peripherals and Programming** On chip peripherals, GPIO, RTC, Watchdog, UART, I2C, I2S, ADC and SPI interfacing and Programming, Repetitive interrupt timer, PWM Block programming, CAN BUS programming, LIN bus programming, DMA programming, Writing LCD drives, Drivers for serial port communication	8

IV	**Peripheral Programming** Design embedded system using Cortex-M3/M4 processors with SPI, UART, ADC, DAC, Memory, Timer, PWM peripherals.	8
V	**Algorithm Designing and Debugging** State Machine based Embedded Programming, Writing initialisation programs, Debugging techniques, Debugging with JTAG, Debugging with UART port, open source tools for software development	6
VI	**Hardware design issues** Selection of electronics components, Reading Schematic, Datasheets, footprints of various components, EDA tool for PCB design, Hierarchical design, Schematic and board layout design, board assembly process, board bring-up, cold and hot testing	6

Assessment
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Text Books	
1	Joseph Yiu, “The definitive guide to ARM Cortex-M3”, Elsevier, 2nd Edition
2	Frank Vahid and Tony Givargis, “Embedded System Design”, Wiley
References	
1	Sloss Andrew N, Symes Dominic, Wright Chris, “ARM System Developer's Guide: Designing and Optimizing”, Morgan Kaufman Publication
2	Steve furber, “ARM System-on-Chip Architecture”, Pearson Education
3	Frank Vahid and Tony Givargis, “Embedded System Design”, Wiley
4	Technical references and user manuals on www.arm.com, NXP Semiconductor www.nxp.com and Texas Instruments www.ti.com, ST Microelectronics www.st.com
Useful Links	
1	NPTEL Lectures

CO-PO Mapping

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

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

Assessment Plan based on Bloom’s Taxonomy Level

Bloom's Taxonomy Level	T1	T2	ESE	Total
Remember	10			
Understand	10		20	
Apply		10	20	
Analyze		10	20	
Evaluate				
Create				
Total	**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli
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AY 2021-22

Course Information

Programme	M.Tech. (Electronics Engineering)
Class, Semester	First Year M.Tech., Sem I
Course Code	5EN560
Course Name	Research Methodology
Desired Requisites:	None

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	LA1	LA2	ESE	Total
Tutorial	-	30	30	40	100
Practical	-	Nil			
Interaction	2 Hrs/week	Credits: 2			

Course Objectives

1	To develop a research orientation among the students and to acquaint them with fundamentals of research methods.
2	To develop understanding of the basic framework of research process and techniques
3	To identify various sources of information for literature review and data collection.
4	To develop an understanding of the ethical dimensions of conducting applied research.
5	To develop understanding about patent process.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	**Classify** various methods to solve research problem.	Apply
CO2	**Construct** a research problem in respective engineering domain.	Apply
CO3	**Investigate** various data analysis techniques for a research problem.	Analyze
CO4	**Identify** various Intellectual Property Rights procedures	Apply

Module	**Module Contents**	**Hours**
I	**Research Fundamentals** What is research, types of research, the process of research, Literature survey and review , Formulation of a research problem.	4
II	**Research Methods** Research design- Meaning, Need and Types , Research Design Process, Measurement and scaling techniques, Data Collection – concept, types and methods, Processing and analysis of data, Design of Experiment	5
III	**Analysis Techniques** Quantitative Techniques, Sampling fundamentals, Testing of hypothesis using various tests like Multivariate analysis, Use of standard statistical software, Data processing, Preliminary data analysis and interpretation, Uni-variate and bi-variate analysis of data, testing of hypotheses.	5
IV	**Research Communication** Writing a conference paper, Journal Paper, Technical report, dissertation/thesis writing. Presentation techniques, software used for report writing such as WORD, Latex etc. Types of journal/conference papers	4

V	**Intellectual Property Rights** Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.	5
VI	**Patents and Patenting Procedures** Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs	4

Text Books	
1	C. R. Kothari, Research Methodology, New Age international
2	Deepak Chopra and Neena Sondhi, Research Methodology : Concepts and cases, Vikas Publishing House, New Delhi

References	
1	E. Philip and Derek Pugh, How to get a Ph. D. – a handbook for students and their supervisors, open university press
2	Stuart Melville and Wayne Goddard, Research Methodology: An Introduction for Science & Engineering Students

Useful Links
NPTEL Lectures

CO-PO Mapping

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

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

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30

LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.				

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply	15			**15**
Analyze	15	10		**25**
Evaluate		10	20	**30**
Create		10	20	**30**
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information

Programme	M.Tech. (Electronics Engineering)
Class, Semester	First Year M.Tech., Sem I
Course Code	5EN551
Course Name	Activity based lab FPGA based system design
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical 2 Hrs/week		Nil			
Interaction	-	**Credits: 1**			

Course Objectives

1	To understand the Product Development Process through Mini Project.
2	To understand budgeting through Mini project
3	To use different FPGA's and implementation methodologies.
4	To learn Configuring and implementing digital embedded system, microcontrollers, Microprocessors, DSP algorithm on FPGA.
5	To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	**Identify** the requirements for the real world problems	Analyze
CO2	**Understand** and plan mini project based on FPGA based systems	Apply
CO3	**Design** and build the project successfully	Design
CO4	**Deliver** technical seminar based on the Mini Project work carried out.	Create

Guidelines for Mini Project

1. The students must understand following aspects while planning Mini Project
   a. Concept of FPGA's and implementation methodologies
   b. Importance
   c. Interdisciplinary
   d. Challenges
   e. Various applications/smart objects
   f. Major Players/Industry, Standards.

2. In discussion with the concerned faculty during Laboratory hours Student should plan the Mini project and prepare synopsis

3. The progress of work and discussion must be documented.

4. Testing of final product, Preparation, Checking & Correcting be done in discussion with faculty

5. The Student must submit a brief project report(25-30 pages) that must include the following
   a. Introduction
   b. Literature survey
   c. Hardware & Software Requirements
   d. System Design Architecture
   e. Implementation (screenshots to be included)
   f. Testing
   g. Conclusion
   h. Future enhancements.
   j. Bibliography

Text Books	
1	FPGA Based Digital Design : Wayne Wolf, Pentice Hall, 2012
2	
3	
4	
References	
1	Digital System Design using VHDL, Charles H. Roth, PWS Publishing, a branch of Thomson Learning
2	Clive Maxfield, “The Design Warriors’s Guide to FPGAs”, Elsevier, 2004.
3	Digital System Design using VHDL, Charles H. Roth, PWS Publishing, a branch of Thomson Learning
4	FPGA product catalog from Xilinx and Altera

Useful Links	
1	**https://nptel.ac.in/**
2	**https://www.coursera.org/**
3	**https://forums.xilinx.com/**
4	

CO-PO Mapping

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

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30

Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.				

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply	15			**15**
Analyze	15	10		**25**
Evaluate		10	20	**30**
Create		10	20	**30**
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli
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AY 2021-22

Course Information

Programme	M.Tech. (Electronics Engineering)
Class, Semester	First Year M.Tech., Sem I
Course Code	5EN552
Course Name	Activity based lab Embedded System Design
Desired Requisites:	Microprocessors / Microcontrollers

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2 Hrs/week	Nil			
Interaction	-	**Credits: 1**			

Course Objectives

1	To understand the Product Development Process through Mini Project.
2	To understand budgeting through Mini project
3	To use Cortex M3 / M4 processor architecture and its features
4	To learn ARM Cortex –M Architecture and Programming
5	To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	**Identify** the requirements for the real world problems	Anal

		yze
CO2	**Understand** and plan mini project based on ARM Cortex –M	Appl y
CO3	**Design** and build the project successfully	Desi gn
CO4	**Deliver** technical seminar based on the Mini Project work carried out.	Creat e

Guidelines for Mini Project
1. The students must understand following aspects while planning Mini Project a. Concept of ARM Cortex –M3/M4 programming b. Importance c. Interdisciplinary d. Challenges e. Various applications/smart objects f. Major Players/Industry, Standards. 2. In discussion with the concerned faculty during Laboratory hours Student should plan the Mini project and prepare synopsis 3. The progress of work and discussion must be documented. 4. Testing of final product, Preparation, Checking & Correcting be done in discussion with faculty 5. The Student must submit a brief project report(25-30 pages) that must include the following a. Introduction b. Literature survey c. Hardware & Software Requirements d. System Design Architecture e. Implementation (screenshots to be included) f. Testing g. Conclusion h. Future enhancements. j. Bibliography

Text Books	
1	Joseph Yiu, “The definitive guide to ARM Cortex-M3”, Elsevier, 2nd Edition
2	Frank Vahid and Tony Givargis, “Embedded System Design”, Wiley
References	
1	Sloss Andrew N, Symes Dominic, Wright Chris, “ARM System Developer's Guide: Designing and Optimizing”, Morgan Kaufman Publication
2	Steve furber, “ARM System-on-Chip Architecture”, Pearson Education
3	Frank Vahid and Tony Givargis, “Embedded System Design”, Wiley

4	Technical references and user manuals on www.arm.com, NXP Semiconductor www.nxp.com and Texas Instruments www.ti.com, ST Microelectronics www.st.com

Useful Links	
1	NPTEL Lectures

CO-PO Mapping

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

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

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)

Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply	15			**15**
Analyze	15	10		**25**
Evaluate		10	20	**30**
Create		10	20	**30**
Total Marks	**30**	**30**	**40**	**100**

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

AY 2021-22

Course Information

Programme	M.Tech. (All Programs)

Class, Semester	Second Year M.Tech., Sem I				
Course Code	5EN553				
Course Name	Presentation and Technical Report Writing				
Desired Requisites:					
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	-	Nil			
Interaction	1 Hrs/week	**Credits: 1**			

Course Objectives	
1	Demonstrate the stages of the writing process (prewrite/draft/revise/edit) and apply them to technical and workplace writing tasks.
2	Produce documents related to technology and writing in the workplace and will have improved their ability to write clearly, concisely, and accurately.
3	Produce the basic components of letters, summaries, descriptions,process explanations, proposals, and other common forms of technical writing.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Understand the use of variety of materials to produce appropriate technical/research reports	Understanding
CO2	Demonstrate the characteristics of technical and business writing	Analyze
CO3	Presentation of the report	Create

Guidelines

1. Gather sources for the purpose of producing a research paper in a particular technical field;
2. Identify and use library resources (such as academic articles published in peer-reviewed journals) using the Internet, including catalogues, databases, indexes, bibliographies, and websites;
3. Adhere to guidelines for scholarly and unbiased sources.
4. Students will properly document sources and synthesize and integrate material from sources with their own ideas in research papers.
5. Documentation must be used in the course, according to the instructor's discretion.

CO-PO Mapping

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

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

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply	30	10		**40**
Analyze		20	10	**30**
Evaluate			10	**10**
Create			20	**20**
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M.Tech. (Electronics Engineering)
Class, Semester	First Year M. Tech., Sem I
Course Code	5EN554
Course Name	Professional Skills 1
Desired Requisites:	

Teaching Scheme (Hrs)		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	-				
Interation	1	**Credits: 1**			

Course Objectives

1	To provide a hands on experience of software in solving complex Electronics engineering problems.
2	To enhance the employability of Electronics engineering student.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, students will be able to,		
CO 1	Use of the software related to Electronics engineering effectively.	Evaluate
CO 2	Develop the solution for Electronics engineering problem using software.	Create
CO 3	Explain the process of problem solving using computing tools.	Understand

Course Content
This course is based on computing as a tool to design and analyse the Electronics system. In the modern day work environment, the Electronics engineers should be able to simulate and solve complex problems on computers. The Electronics engineer must be highly computer literate. The engineer with strong fundamentals in Electronics Engineering and computer software proficiency is highly in demand from industry. Employability of the student can be enhanced by providing software training in Electronics engineering.

Text Books	
1	Suitable books based on the software selected.

References	
1	Suitable books based on the contents of software selected

Useful Links	
1	As per the need of the software training

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

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30

Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.				

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand	10	10	10	**30**
Apply				
Analyze				
Evaluate	10	10	15	**35**
Create	10	10	15	**35**
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2021-22					
Course Information					
Programme	M.Tech. (Electronics Engineering)				
Class, Semester	First Year M.Tech., Sem I				
Course Code	5EN511				
Course Name	Professional Elective 1 -Advanced Digital Signal Processing				
Desired Requisites:	Signals and Systems, Digital Signal Processing				
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-	Nil			
Interaction	-	**Credits: 3**			

Course Objectives	
1	To illustrate the concepts of Advanced Signal Processing
2	To explain the different techniques for design of filters and multirate systems
3	To enable the students for the design and development of Adaptive DSP systems

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Explain the basic and advanced signal processing concepts	Discuss
CO2	Design FIR and IIR filters with given specifications	Design, Solve
CO3	Analyse the various algorithms related with multi-rate DSP	Analyz

		e
CO4	Illustrate adaptive signal processing algorithms	Demonstrate

Module	Module Contents	Hours
I	**Review of Digital Signal Processing** Discrete Time Signals and systems, LTI Systems, Basic Signal Processing Operations, Discrete Time Systems-Classification, impulse and step responses, phase and group delays. Time domain and frequency domain characterization of LTI discrete time systems, Z Transform, Transfer function	8
II	**DSP Structures** Block Diagram Representation, Equivalent Structures, Basic FIR Digital Filter Structures, Basic IIR Digital Filter Structures, All pass Filters, Tuneable IIR Digital Filters, IIR Tapped Cascaded Lattice Structures, FIR Cascaded Lattice Structures, Parallel All pass Realization of IIR Transfer Functions	6
III	**DFT Computation Techniques** DFT-Definition and properties, symmetry properties, Circular convolution, Computation of DFT, Decimation in time (DIT) and Decimation in Frequency (DIF) Fast Fourier transform (FFT) algorithms , Linear filtering using FFT- overlap add, overlap save methods, Goertzel Algorithm	6
IV	**Filter Design Technique** Bilinear Transformation Method of IIR Filter Design, Design of Low pass IIR Digital Filters, Design of High pass, Band pass and Band stop IIR Digital Filters, Spectral Transformations of IIR Filters, FIR Filter Design Based on Windowed series, Design of Digital Filters with Least-Mean-Square Error, Constrained Least-Square Design of FIR Digital Filters	8
V	**Multi-rate Signal Processing** The Basic Sample Rate Alteration Devices, Filters in Sampling Rate Alteration Systems, Multistage Design of Decimator and Interpolator, The Poly phase Decomposition, Arbitrary-Rate Sampling Rate Converter, Digital Filters Banks, Two-Channel Quadrature-Mirror Filter bank	6
VI	**Introduction to adaptive signal processing** Introduction to Adaptive Filters, Steepest descent technique, LMS algorithm-Convergence analysis, Learning curve, SVD	6

Text Books	
1	Sanjit K. Mitra, "Digital Signal Processing – A Computer based approach", Tata McGraw-Hill, 4th Edition , 2013
2	Bernard Widrow, Samuel D. Stearns "Adaptive Signal Processing,", Prentice-Hall, Englewood Cli, NJ, 1985
References	
1	J. G. Proakis, Dimitris K Manolakis, "Advanced Digital Signal Processing Principals, Algorithms and Applications,", Pearson,2007
Useful Links	
1	NPTEL Lectures
CO-PO Mapping	

	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1			2												
CO2						1									
CO3				2											
CO4															
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.															

Assessment
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand				
3	Apply	20	10	30	
4	Analyze		10	30	
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2021-22					
Course Information					
Programme	MTech. (Electronics engineering)				
Class, Semester	First Year MTech., Sem II				
Course Code	5EN512				
Course Name	Professional Elective 1 : Digital VLSI Design				
Desired Requisites:	Digital Techniques				
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-	Nil			
Interaction	-	**Credits: 3**			
Course Objectives					

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*		
1	To explain the relevance of CMOS technology in implementing digital circuits	
2	To discuss in details various logic styles (static, dynamic) in implementing CMOS circuits and the effect of choosing a particular style on device performance from delay, power and area point of view.	
3	To develop the architectures of few data-path designs (system building blocks) and an insight into extracting the functionality of displayed CMOS circuit	
4	To motivate the students to develop lifelong/self-learning attitude	
Course Outcomes (CO) with Bloom's Taxonomy Level		
After the completion of the course the student should be able to		
CO1	**Apply** the analytical expressions involving physical parameters, process parameters and electrical parameters to characterize the MOS transistors **by taking into account** the fundamental principles involved with MOS devices	Illustrate
CO2	**Analyze** static and dynamic CMOS circuits numerically to compute the various device parameters and circuit performance parameters computational skills.	Develop
CO3	**Analyze** static and dynamic CMOS circuits numerically to compute the various device parameters and circuit performance parameters	Analyze
CO4	**Select** an appropriate logic style to design submicron MOS transistor based circuits using logical, analytical and computational skills.	Design
CO5	**Design** the self timed CMOS circuits, and synchronous circuits with built-in arbiters, synchronizers	Develop

Module	Module Contents	Hours
I	**MOS Transistor** MOS transistor theory, MOS under static conditions, Secondary effects, Technology Scaling	4
II	**CMOS Inverter** CMOS inverter, Static and Dynamic behaviour of CMOS inverter, Power and Energy-Delay, Impact of technology scaling on inverter	6
III	**Combinational Static Logic Design** Combinational static logic designs in CMOS, CMOS (Inverter and Complex gates), pseudo-nmos, pass-transistor logic, transmission gate logic and design aspects for optimizing the performance	8
IV	**Combinational Dynamic Logic Design** Combinational dynamic logic designs using pre-charge evaluate logic, domino logic, np-CMOS logic , design aspects for optimizing the performance, Comparison of static and dynamic designs	
V	**Sequential Logic Design** Timing metrics of sequential circuits, Sequential logic designs in CMOS, Static and dynamic latches and registers	8
VI	**Timing Issues in Digital Circuits** Timing Classification, Synchronous Design (Clock skew, Jitter, Clock Distribution), Self-Timed Circuits Design, Synchronizers and arbiters, Using PLL for clock synchronization	7

Text Books	
1	1. Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, "*Digital Integrated Circuits, A System Perspective*", Pearson Education, Second Edition, First Indian Reprint, 2003.
2	2. Neil Weste, Kamran Eshraghian "*Principles of CMOS VLSI Design*", Addison Wesley/Pearson Education, 2010

References	
1	Kamran Eshraghian, Pucknell and Eshraghian "*Essentials of VLSI Circuits and Systems*", , Prentice-Hall (India), 2008
2	Sung-Mo Kang, Yusuf Leblebici "*CMOS Digital Integrated Circuits: Analysis and Design*", McGraw Hill Education (India), Third Edition, 2003
3	Neil Weste, David Harris, Ayan Banerjee "*CMOS VLSI Design*", Pearson Education, 2008

Useful Links	
1	NPTEL Lectures

CO-PO Mapping

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

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

Assessment

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level		T1	T2	ESE	Total
1	Remember				
2	Understand				
3	Apply	20	10	30	**60**
4	Analyze		10	30	**40**
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2021-22					
Course Information					
Programme	M.Tech. (Electronics Engineering)				
Class, Semester	First Year MTech., Sem II				
Course Code	5EN513				
Course Name	Professional Elective 2-Biomedical Signal Processing				
Desired Requisites:	Signals and Systems, Digital Signal Processing				
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-	Nil			
Interaction	-	**Credits: 3**			

Course Objectives	
1	To study origins and characteristics of some of the most commonly used biomedical signals including ECG, EEG, evoked potentials, and EMG
2	To explore application of established engineering methods to complex biomedical signals problems

Course Outcomes (CO) with Bloom's Taxonomy Level		
After the completion of the course the student should be able to		
CO1	Apply signal processing techniques to biomedical signals	Applying
CO2	Analyze ECG and EEG signal with characteristic feature points	Analyzing
CO3	Model a biomedical system	Creating

Module	**Module Contents**	**Hours**
I	**Introduction to Biomedical Signals** Introduction to Biomedical Signals, The nature of Biomedical Signals, Examples of Biomedical Signals, Objectives and difficulties in Biomedical analysis, Signal Conversion Systems, Conversion requirements for biomedical signals, Signal conversion circuits. Application areas of Bio -Signal analysis – EEG, ECG, Phonocardiogram, Spiro Gram, Evoked Signals	7
II	**Signal Averaging and Data Compression Techniques** Basics of signal averaging, signal averaging as a digital filter, a typical averager, software for signal averaging, limitations of signal averaging. Turning point algorithm, AZTEC algorithm, Fan algorithm, Huffman coding	6
III	**Adaptive Noise Cancellation** Adaptive interference / Noise cancellation: Types of noise in biosignals; Digital filters - IIR and FIR - Notch filters - Optimal and adaptive filters. Weiner filters - steepest descent algorithm - LMS adaptive algorithm - Adaptive noise canceller - cancellation of 50 Hz signal in ECG - Cancellation of maternal ECG in foetal electrocardiography	6

IV	**Cardiological signal processing** Basic Electrocardiography, ECG data acquisition, ECG lead system, ECG signal characteristics (parameters and their estimation), Analog filters, ECG amplifier, and QRS detector, Power spectrum of the ECG, Bandpass filtering techniques, Differentiation techniques, Template matching techniques, A QRS detection algorithm, Realtime ECG processing algorithm, ECG interpretation, ST segment analyzer, Portable arrhythmia monitor.	7
V	**Neurological signal processing** Neurological signal processing: The brain and its potentials, The electrophysiological origin of brain waves, The EEG signal and its characteristics (EEG rhythms, waves, and transients), Correlation. Analysis of EEG channels: Detection of EEG rhythms, Template matching for EEG, spike and wave detection	6
VI	**Modeling of Biomedical Systems** Motor unit firing pattern, Cardiac rhythm, Formants and pitch of speech, Point process, Parametric system modeling, Autoregressive model, Autocorrelation method, Application to random signals, Computation of model parameters, Levinson-Durbin algorithm, Computation of gain factor, Covariance method, Spectral matching and parameterization, Model order selection, Relation between AR and Cepstral coefficients	8

Text Books	
1	Reddy D C. "Modern Biomedical Signal Processing – Principles and Techniques", TMH, New Delhi, 2005
2	Eugene N. Bruce, "Biomedical Signal Processing and Signal Modeling", A Wiley-Interscience Publication JOHN WILEY & SONS, INC

References	
1	1. Akay M. "Biomedical Signal Processing", Academic press, California,1994.
2	Bronzino J D "The Biomedical Engineering handbook", CRC and Free press, Florida, 1995.

Useful Links	
1	NPTEL LECTURES

CO-PO Mapping

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

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

Assessment
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand				
3	Apply	20	10	30	**60**
4	Analyze		10	30	**40**
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2021-22					
Course Information					
Programme	M.Tech. (Electronics Engineering)				
Class, Semester	First Year M.Tech., Sem I				
Course Code	5EN514				
Course Name	Professional Elective 2-Embedded Linux Programming				
Desired Requisites:	Nil				
Teaching Scheme	**Examination Scheme (Marks)**				
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-	Nil			
Interaction	-	**Credits: 3**			

Course Objectives	
1	To make students familiar with installation and use of the embedded Linux operating system
2	To facilitate the students to learn the fundamentals of Linux as applied to embedded hardware
3	To give exposure to system design using embedded Linux as per the industry trends
Course Outcomes (CO) with Bloom's Taxonomy Level	

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

CO1	Apply the understanding of Linux for Linux administration	Apply
CO2	Write, compile, debug multi-file, multi-threaded programs under Linux using utilities like make, gdb etc.	Write
CO3	Write programs for peripherals such as GPIO/Keyboard/LCD/Serial port, Programs for camera handling and signal processing for EL hardware	Design
CO4	Design external hardware for EL board such as Raspberry pi	Design

Module	Module Contents	Hours
I	**Introduction** Introduction to Linux, Linux Distributions, Open source Software, GPL, Facilities in Embedded Linux Boards used in Industry/Market, Important Accessories of Linux boards available/used in industry, Care to take in handling the Linux boards, Development Setup for EL, OS installation, init process, initrd, boot loaders, lilo and GRUB boot loaders, Case studies of Embedded Linux Based Systems	5
II	**Linux file system and commands** Linux File System, Permissions, CLI and Linux Shells, Linux Commands, Linux concepts, Shell Script, Basic Linux system administration tasks on the RPi. Linux commands for file and process management. Linux Programming, Multi-file C programming Using make utility, Makefile, GNU debugger. Transferring Files Between Systems**,** Kernel, building kernel image	6
III	**Multithreading and Hardware Access** Threads and processes, Multithreaded C programming. EL hardware design issues, Logic-level translation circuitry. Case studies of hardware of frequently used interfaces, Communication with EL board through network, EL GPIO control using sysfs, wiringPi and python. Python libraries	7
IV	**Hardware Interfacing and Programming-I** Using onboard I2C, SPI, and UART capabilities. Circuits to the RPi that interface to its I2C bus, Linux I2C-tools. Communicate between UART devices using both Linux tools and custom C or Python code. Interface to a low-cost GPS sensor using a UART connection. Extend the input/output capability using external serial ADCs, DACs, Increase the number of available GPIOs on the RPi using both I2C and SPI GPIO expanders	7

V	**Hardware Interfacing and Programming-II** Using Interrupt functionality on devices. Increasing the number of available serial UART devices on the RPi using low-cost USB-to-TTL devices. USB Bluetooth adapter for the RPi and connect to it from a mobile device for the purpose of building a basic remote-control application. Using Wi-Fi and Xigbee along with EL board. Hardware design for given system specifications	7
VI	**Basic Image Processing on Embedded Linux** Camera interfacing to EL board, Capture image and video. Stream video data to the Internet using Linux applications and UDP, multicast, and RTP streams. Using OpenCV to perform basic image processing on the RPi. Use OpenCV to perform a computer vision face-detection task. Play audio data on the using HDMI audio and USB audio adapters	7

Text Books	
1	Christopher Hallinan, *"Embedded Linux Primer: A Practical Real-World Approach",* Prentice Hall; 1st edition (September 28, 2006), ISBN 978-0137017836 Richard Stones, Neil Matthew, *"Beginning Linux Programming"*, Wiley; Fourth edition (2008) Felix Alvaro, "LINUX: Easy Linux For Beginners", Amazon.com Karim Yaghmour, Jon Masters, Gilad Ben-Yossef, Philippe Gerum, *"Building Embedded Linux Systems",* O'Reilly Media; Second Edition (August 22, 2008) ISBN: 978-0596529680
2	Richard Stones, Neil Matthew, *"Beginning Linux Programming"*, Wiley; Fourth edition (2008)
3	Felix Alvaro, "LINUX: Easy Linux For Beginners", Amazon.com Karim Yaghmour, Jon Masters, Gilad Ben-Yossef, Philippe Gerum, *"Building Embedded Linux Systems",* O'Reilly Media; Second Edition (August 22, 2008) ISBN: 978-0596529680
References	
1	P. Raghavan, Amol Lad, Sriram Neelakandan, *"Embedded Linux System Design and Development",* Auerbach Publications; 1 edition (December 21, 2005), ISBN: 978-0849340581 http://crashcourse.ca/introduction-Linux-kernel-programming-2nd-edition
2	http://crashcourse.ca/introduction-Linux-kernel-programming-2nd-edition
Useful Links	
1	NPTEL Lectures

CO-PO Mapping

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

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

Assessment
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand				
3	Apply	20	10	30	**60**
4	Analyze		10	30	**40**
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2021-22					
Course Information					
Programme	M. Tech. (Electronics Engineering)				
Class, Semester	First Year M. Tech., Sem I				
Course Code	5IC502				
Course Name	Constitution of India				
Desired Requisites:					
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: Nil**			
Course Objectives					
1	To review and create awareness on various provisions in the constitution of India.				
Course Outcomes (CO) with Bloom's Taxonomy Level					
At the end of the course, students will be able to,					

CO1	Explain the premises informing the twin themes of liberty and freedom from a civil rights perspective.	understand
CO2	Address the growth of Indian opinion regarding modern Indian intellectuals constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism	understand
CO3	Address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution	understand

Module	Module Contents	Hours
I	History of Making of the Indian Constitution Drafting Committee, (Composition & Working	4
II	**Philosophy of the Indian Constitution :** Preamble, Salient Feature	4
III	**Contours of Constitutional Rights:** Fundamental Rights; Right to Equality; Right to Freedom; Right against Exploitation; Right to Freedom of Religion; Cultural and Educational Rights; Right to Constitutional Remedies; Directive Principles of State Policy; Fundamental Duties.	5
IV	**Organs of Governance:** Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions	5
V	**Local Administration:** District"s Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy	5
VI	**Election Commission:** Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.	5

Text Books	
1	Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
2	M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014
3	D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015

References	
1	The Constitution of India, 1950 (Bare Act), Government Publication

Useful Links	
1	https://en.wikipedia.org/wiki/Constituent_Assembly_of_India
2	https://nptel.ac.in/courses/129/106/129106003/
3	https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-lw02/
4	https://eci.gov.in/about/about-eci/the-functions-electoral-system-of-india-r2/

CO-PO Mapping	
	Programme Outcomes (PO)

	1	2	3	4	5	6
CO1			1			
CO2	2					
CO3				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.						

Assessment (for Theory Course)
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3,4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	20	20	60	100
3	Apply				
4	Analyze				
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Electronics Engineering)
Class, Semester	First Year M. Tech., Semester II
Course Code	5EN521
Course Name	RTOS based system Design
Desired Requisites:	Embedded System Design

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives	
1	To illustrate Real Time operating system with multi-tasking
2	To illustrate task synchronization of various tasks
3	To develop student in latest Buses Like USB, Ethernet

4	To develop student to design GUI Applications

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	**Illustrate** RTOS concepts and multitasking to embedded systems	Understand
CO2	**Design** RTOS based systems with Process Synchronization using semaphore, mutex , flags, messages etc.	Apply
CO3	**Explain** Advanced multi-core processing systems and inter processor communication.	Apply
CO4	**Design** embedded GUI based system, API for USB	Create
CO5	**Create** embedded system using various IO peripheral	Create

Module	**Module Contents**	**Hours**
I	**RTOS Programming:-** Need and Requirements of RTOS, Concept of Multitasking, Priority inversion, RTOS structure, TCB block design, Repetitive Timer Requirement, Memory Requirement for each Task	6
II	**RTOS Process Synchronization:-** System events and interrupts. Task synchronization with Flags, Semaphore, Mutex. Inter process communication with Messages queue/ Mail Box	6
III	**Multi core processors:-** Programming on Multi core processors, inter-core communication, interrupts handling, software architecture for multi core processors.	7
IV	**GUI Programming:-** Graphical Display Interface, Touch Screen Interface, Graphic Display drivers, GUI API calls for Windows, Dialogs programming, Designing Menu, Widgets programming for Textbox, Label, Combo box etc. Designing Application with GUI	7
V	**USB Programming:-** USB 2.0 specifications, USB block diagram, Device , Host Interface, concept of endpoint, Data transfer on USB bus, Various USB data transfers, API for USB Host and Device Programming, Writing Application with USB Host and Device	7
VI	**Ethernet Programming & Embedded Application**:-Motivation, Ethernet Interface, API for Ethernet Programming, Writing Server Application with Ethernet interface. Designing Server Application with GUI	6

Text Books	
1	The Real-Time Kernel by Micrium
2	Real-time Operating Systems: Book 1 - The Theory (The engineering of real-time embedded systems) by Jim Cooling
3	Embedded Systems: Introduction to Arm® Cortex™-M Microcontrollers , Fifth Edition (Volume 1) by Jonathan W Valvano

References	
1	http://www2.keil.com/mdk5/cmsis/
2	User Guide and Reference Guide of LPC 1768, STM32F7
3	www.usb.org › Developers › Documents
4	https://www.segger.com/

Useful Links	
1	https://www.edx.org/ https://www.udacity.com/
2	https://www.coursera.org/ https://www.kernel.org/
3	https://community.arm.com/

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

CO1			2												
CO2			2												
CO3			2												
CO4				2											
CO5				2		2							1	1	

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

Assessment (for Theory Course)
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3,4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	10	5	10	**25**
3	Apply	10	5	20	**35**
4	Analyze				
5	Evaluate				
6	Create		10	30	**40**
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	M. Tech. (Electronics Engineering)
Class, Semester	First Year M.Tech., Sem II
Course Code	5EN522
Course Name	Wireless Sensor Networks and IoT
Desired Requisites:	None

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	**3 H/W**	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	**20**	**20**	**60**	**100**
Practical	**-**	Nil			
Interaction	**-**	**Credits: 3**			

Course Objectives	
1	To explain the Wireless Sensor Network and its applications
2	To develop understanding of the Sensor node architecture
3	To understand WSN connectivity with Internet

4	To compare various MAC protocols for Wireless Sensor Network	
5	To explain in a concise manner how the general Internet as well as Internet of Things work.	
Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	**Identify** various challenges and applications of Wireless Sensor Network	Apply
CO2	**Develop** knowledge about Wireless Sensor Network Architecture	Apply
CO3	**Investigate** various MAC protocols for Wireless Sensor Networks	Analyze
CO4	**Explore** and learn about Internet of Things and Cloud	Apply

Module	Module Contents	Hours
I	**Module 1 : Introduction of WSN** Overview of Wireless Sensor Networks, Applications and Challenges, Mobile ad hoc networks and wireless sensor networks	4
II	**Module 2 Wireless Sensor Node Architecture** Hardware components, Energy consumption , Operating systems and execution environments , examples of sensor nodes	5
III	**Module 3 Wireless Sensor Network Architecture** Types of sources and sinks, Optimization Goals and Figures of Merit, Design principles for WSNs, Gateway Concepts, Need for gateway, WSN and Internet Communication, WSN Tunneling	5
IV	**Module:4 WSN (Medium access control)** Fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts, Contention Based protocols, Schedule-based protocols - SMAC – BMAC, Traffic-adaptive medium access protocol (TRAMA), The IEEE 802.15.4 MAC protocol.	5
V	**Module 5 IoT** IoT definitions: overview, applications, potential & challenges, and architecture. M2M Protocols for Sensor Networks. IoT CASE Study.	5
VI	**Module 6 Cloud and SDN** Introduction to Cloud Computing including benefits, challenges, and risks Cloud Computing Models. SDN: Introduce software defined networking: the background, the development, and the challenges.	4

Text Books	
1	Kazem Sohraby, Daniel Minoli, Taieb Znati, "Wireless Sensor Networks Technology Protocols and Applications", John Wiley & Sons Inc. Publication ,2007
2	"Internet of Things Applications and Protocols ", Wiely publication 2nd Ed.

References	
1	Edgar H. Callaway, Jr. and Edgar H. Callaway, "Wireless Sensor Networks: Architectures and Protocols" ,CRC Press, August 2003
2	Akyildiz, Mehmet Can Vuran**,"**Wireless Sensor Networks" ,John Wiley & Sons Ltd. 2010
3	William Stallings "Foundations of Modern Networking : SDN, NFV, QoE, IoT and Cloud" Pearson Education

Useful Links	
1	https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs09/
2	https://onlinecourses.nptel.ac.in/noc21_cs17/preview

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

Assessment (for Theory Course)
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3,4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand				
3	Apply	20	20	30	**70**
4	Analyze			30	**30**
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*	
AY 2021-22	
Course Information	
Programme	M. Tech. (Electronics Engineering)
Class, Semester	First Year M. Tech., Semester II

Course Code		5EN571			
Course Name		Activity based lab RTOS based system Design			
Desired Requisites:		Embedded System Design			
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2 Hrs/week				
Interaction	-	**Credits: 1**			

Course Objectives	
1	To understand the Product Development Process through Mini Project.
2	To understand budgeting through Mini project
3	To design RTOS based systems
4	To learn GUI based system design
5	To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	**Design** RTOS based systems with Process Synchronization using semaphore, mutex , flags, messages etc.	Apply
CO2	**Explain** Advanced multi-core processing systems and inter processor communication.	Apply
CO3	**Design** embedded GUI based system, API for USB	Create
CO4	**Create** embedded system using various IO peripheral	Create

Guidelines for Mini Project

1. The students must understand following aspects while planning Mini Project
   a. Concept of RTOS based system
   b. Importance
   c. Interdisciplinary
   d. Challenges
   e. Various applications/smart objects
   f. Major Players/Industry, Standards.

2. In discussion with the concerned faculty during Laboratory hours Student should plan the Mini project and prepare synopsis

3. The progress of work and discussion must be documented.

4. Testing of final product, Preparation, Checking & Correcting be done in discussion with faculty

5. The Student must submit a brief project report(25-30 pages) that must include the following
   a. Introduction
   b. Literature survey
   c. Hardware & Software Requirements
   d. System Design Architecture

	e. Implementation (screenshots to be included) f. Testing g. Conclusion h. Future enhancements. j. Bibliography
Text Books	
1	The Real-Time Kernel by Micrium
2	Real-time Operating Systems: Book 1 - The Theory (The engineering of real-time embedded systems) by Jim Cooling
3	Embedded Systems: Introduction to Arm® Cortex™-M Microcontrollers , Fifth Edition (Volume 1) by Jonathan W Valvano
References	
1	http://www2.keil.com/mdk5/cmsis/
2	User Guide and Reference Guide of LPC 1768, STM32F7
3	www.usb.org › Developers › Documents
4	https://www.segger.com/
Useful Links	
1	https://www.edx.org/ https://www.udacity.com/
2	https://www.coursera.org/ https://www.kernel.org/
3	https://community.arm.com/

CO-PO Mapping															
	Programme Outcomes (PO)												**PSO**		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1			2												
CO2			2												
CO3			2												
CO4				2											
CO5				2		2							1	1	
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.															

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply	15			**15**
Analyze	15	10		**25**
Evaluate		10	20	**30**
Create		10	20	**30**
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)						
AY 2021-22						
Course Information						
Programme		M.Tech. (Electronics Engineering)				
Class, Semester		First Year M.Tech., Sem II				
Course Code		5EN572				
Course Name		Activity based lab Wireless Sensor Networks and IoT				
Desired Requisites:		None				
Teaching Scheme		**Examination Scheme (Marks)**				
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**	
Tutorial	-	30	30	40	100	
Practical 2 Hrs/week		Nil				
Interaction	-	**Credits: 1**				
Course Objectives						
1	To understand the Product Development Process through Mini Project.					
2	To understand budgeting through Mini project					
3	To use Wireless Sensor Network protocols					
4	To learn IoT sensors interfacing					
5	To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.					
Course Outcomes (CO) with Bloom's Taxonomy Level						
At the end of the course, the students will be able to,						
CO1	**Identify** various challenges and applications of Wireless Sensor Network					Apply
CO2	**Develop** knowledge about Wireless Sensor Network Architecture					Apply
CO3	**Investigate** various MAC protocols for Wireless Sensor Networks					Analyze
CO4	**Explore** and learn about Internet of Things and Cloud					Apply
Mini Project Guideline						

6. The students must understand following aspects while planning Mini Project
   a. Concept of WSN and IoT
   b. Importance
   c. Interdisciplinary
   d. Challenges
   e. Various applications/smart objects
   f. Major Players/Industry, Standards.

7. In discussion with the concerned faculty during Laboratory hours Student should plan the Mini project and prepare synopsis

8. The progress of work and discussion must be documented.

9. Testing of final product, Preparation, Checking & Correcting be done in discussion with faculty

10. The Student must submit a brief project report(25-30 pages) that must include the following
    a. Introduction
    b. Literature survey
    c. Hardware & Software Requirements
    d. System Design Architecture
    e. Implementation (screenshots to be included)
    f. Testing
    g. Conclusion
    h. Future enhancements.
    j. Bibliography

Text Books	
1	Kazem Sohraby, Daniel Minoli, Taieb Znati, "Wireless Sensor Networks Technology Protocols and Applications", John Wiley & Sons Inc. Publication ,2007
2	"Internet of Things Applications and Protocols ", Wiely publication 2nd Ed.
References	
1	Edgar H. Callaway, Jr. and Edgar H. Callaway, "Wireless Sensor Networks: Architectures and Protocols" ,CRC Press, August 2003
2	Akyildiz, Mehmet Can Vuran**,"**Wireless Sensor Networks" ,John Wiley & Sons Ltd. 2010
3	William Stallings "Foundations of Modern Networking : SDN, NFV, QoE, IoT and Cloud" Pearson Education
Useful Links	
1	https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs09/
2	https://onlinecourses.nptel.ac.in/noc21_cs17/preview

CO-PO Mapping		
	Programme Outcomes (PO)	PSO

	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1			2	3											
CO2				1		3									
CO3			3			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.

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.				

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply	15			**15**
Analyze	15	10		**25**
Evaluate		10	20	**30**
Create		10	20	**30**

Total Marks	**30**	**30**	**40**	**100**

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Course Information

Programme	M.Tech. (Electronics Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5EN573
Course Name	Industrial Project
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical					
Interaction	1 Hr/Week	**Credits: 1**			

Course Objectives

1	To understand industrial problems.
2	To suggest engineering solutions to the defined problem.
3	
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Chose, Formulate a clear problem.	Apply
CO2	Select and apply appropriate engineering methods and tools for solving the problem.	Create
CO3	Develop the project and its results following an established project methodology.	Evaluate
CO4	Present the project results.	Analyze

List of Experiments / Lab Activities

Industrial Project:
The Industry project will involve the selection of appropriate real time industry problem by understanding the working of particular industry application. Formulate the problem, select design and methodology to find the solution. Construct an electronic system by using appropriate hardware software tools. Each student should conceive, design and develop the idea leading to a project/product. The student should submit a soft bound report at the end of the semester. The final product as a result of Industry project should be demonstrated in phases at the time of examination.
This will help student to understand structured management in industry , sustainable development, with consideration to both scientific and ethical aspects and its presentation with technical report.

Text Books

1	To be used based on selected project
2	

References	
1	Industry 4.0 : fourth Industrial Revolution guide to Industry 4.0
2	
Useful Links	
1	
2	

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

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation				
Assessment	**Based on**	**Conducted by**	**Typical Schedule**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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..				

Assessment Plan based on Bloom's Taxonomy Level				
Bloom's Taxonomy Level	**LA1**	**LA2**	**ESE**	**Total**
Remember				
Understand	30	10		**40**
Apply		10	5	**20**
Analyze		10	5	**20**
Evaluate				
Create			30	**30**
Total	**30**	**30**	**40**	**100**

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Course Information	
Programme	M. Tech. (Electronics Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5EN574
Course Name	Professional Skills 2
Desired Requisites:	

Teaching Scheme		Examination Scheme (Marks)			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	-				
Interaction	1 Hr/Week	**Credits: 1**			

Course Objectives

1	To provide a hands on experience of software in solving complex Electronics Engineering problems.
2	To enhance the employability of Electronics Engineering student.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Use of the software related to Electronics Engineering effectively.	Evaluate
CO2	Develop the solution for Electronics Engineering problem using software.	Create
CO3	Explain the process of problem solving using computing tools.	Understand

Course Content

This course is based on computing as a tool to design and analyse the Electronics Engineering system. In the modern day work environment, the Electronics Engineer should be able to simulate and solve complex problems on computers. The Electronics Engineer must be highly computer literate. The engineer with strong fundamentals and computer software proficiency is highly in demand from industry. Employability of the student can be enhanced by providing software training.

Text Books

1	Suitable books based on the software selected.

References

1	Suitable books based on the contents of software selected

Useful Links

1	As per the need of the software training

CO-PO Mapping

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

Assessment				
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.				
Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40
Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.				

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand	10	10	10	**30**
Apply				
Analyze				
Evaluate	10	10	15	**35**
Create	10	10	15	**35**
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information					
Programme	M. Tech. (Electronics Engineering)				
Class, Semester	First Year M. Tech., Semester II				
Course Code	5EN523				
Course Name	Professional Elective – 3 Image Processing and Pattern Recognition				
Desired Requisites:	Signal Processing				
Teaching Scheme		**Examination Scheme (Marks)**			
ISE2	2 Hrs/week	**T1**	**T2**	**ESE**	**Total**
10	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 2**			

Course Objectives		
1	To imparts knowledge in the area of image and image processing	
2	To learn the fundamentals of Pattern recognition and to choose an appropriate feature	
3		
Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Use foundational techniques of image processing and analysis such as filtering, segmentation and local features to solve image processing problems of real world application	Apply
CO2	Apply image processing and pattern recognition techniques to detect objects and activities in images	Apply
CO3	Compare and parameterize different learning algorithms.for pattern recognition	Analyze
CO4		

Module	Module Contents	
I	**Fundamentals of Image Processing:** Pixel brightness transformation, position dependent brightness correction, gray scale transformation; geometric transformation, local pre-processing image smoothening, edge detectors, zero-crossing, scale in image processing, canny edge detection, parametric edge models, edges in multi spectral images, local pre-processing and adaptive neighbourhood pre-processing; image restoration	**5**
II	**Image Segmentation:** Threshold detection methods, optimal thresholding, multispectral thresholding, thresholding in hierarchical data structures; edge based image segmentation- edge image thresholding, edge relaxation, border tracing, border detection	**3**
III	**Mathematical Morphology:** Basic morphological concepts, four morphological principles, binary dilation, erosion, Hit or miss transformation, opening and closing; thinning and skeleton algorithms; Morphological segmentation –particles segmentation and watersheds, particle segmentation	**5**
IV	**Image Textures:** statistical texture description, methods based on spatial frequencies, co-occurrence matrices, edge frequency, and texture recognition method, applications Image representation and description-representation, boundary descriptors, regional descriptors	**4**
V	**Fundamentals of Pattern Recognition:** Basic concepts of pattern recognition, fundamental problems in pattern recognition system, design concepts and methodologies, example of automatic pattern recognition systems, a simple automatic pattern recognition model	**4**
VI	**Pattern Classification Algorithms:** Pattern classification by distance function: Measures of similarity. Clustering criteria. K means algorithm. Pattern classification by like hood function: Pattern classification as a Statistical decision problem. Bayes classifier for normal patterns	**5**

Text Books	
1	Earl Gose and Richard Johnsonbaugh Steve Jost, "Pattern Recognition and Image Analysis", PHI publication.

2	Sing Tze Bow, M. Dekker, “Pattern Recognition and Image Processing”, Springer, 1992
3	

References	
1	Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, Addinson – Wesley.
2	M. A. SID – AHMED, “Image Processing Theory Algorithms and Architecture”, McGraw Hill Inc.
3	

Useful Links	
1	https://www.coursera.org/
2	
3	
4	

CO-PO Mapping

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

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

Assessment

The assessment is based on 2 in-semester evaluations (ISE) of 10 marks each, 1 mid-sem examination (MSE) of 30 marks and 1 end-sem examination (ESE) of 50 marks.
MSE is based on the modules taught till MSE (typically Module 1-3) and ESE is based on all modules with 30-40% weightage on modules before MSE and 60-70% weightage on modules after MSE.

Assessment Plan based on Bloom’s Taxonomy Level (Marks) For Theory Course

Bloom’s Taxonomy Level		T1	T2	ESE	Total
1	Remember				
2	Understand	20	10		**30**
3	Apply			30	**30**
4	Analyze		10	30	**40**
5	Evaluate				
6	Create				
Total		**20**	**20**	**60**	**100**

	AY 2021-22					
	Course Information					
	Programme		M.Tech. (Electronics Engineering)			
	Class, Semester		First Year M.Tech., Sem II			
	Course Code		5EN524			
	Course Name		Professional elective 3 - Analog VLSI Design			
	Desired Requisites:		None			
	Teaching Scheme		**Examination Scheme (Marks)**			
	Lecture	-	**T1**	**T2**	**ESE**	**Total**
	Tutorial	-	20	20	60	100
	Practical	2 Hrs/week	Nil			
	Interaction	-	**Credits: 2**			

	Course Objectives	
	1	To explain the analog circuit concepts based on MOS devices in such a way to develop in students the insight and intuition towards MOS circuits
	2	To deliver the tips (or thumb rules) related with design of analog circuits throughout the course
	3	To motivate the students to develop lifelong/self-learning attitude through the individual task assignment
	Course Outcomes (CO) with Bloom's Taxonomy Level	
	At the end of the course, the students will be able to,	
	CO 1	**Analyze** MOS device circuits to derive the dependence of various electrical parameters analytically and graphically. — Analyze
	CO 2	**Develop** large signal and small signal models for single stage amplifiers and differential amplifiers using MOS transistors and derive the gain relationships — Apply
	CO 3	**Design** common source, common gate, common drain amplifier for given specifications. Further recognize their application under various typical situations. — Create
	CO 4	**Criticize** the application of passive and active current mirrors as constant current sources of required current value for multiple blocks of the circuit and explain the properties of differential pairs using such circuits as loads. — Apply

	Module	**Module Contents**	**Hours**
	I	**Module 1:MOS Device Physics** MOS transistor Characteristics, Second Order Effects, MOS device models (MOS device capacitance, MOS small signal model) MOS model parameters	4
	II	**Module 2:Single Stage Amplifier Part I** CS stage with resistance load, diode connected load, current source load, CS stage with source degeneration	6
	III	**Module 3 :Single Stage Amplifier Part II**	5

		source follower, common-gate stage, cascade stage, folded cascade, choice of device models	
	IV	**Module 4: Differential Amplifiers** Basic difference pair, differential mode response, common mode response, Differential pair with MOS loads	6
	V	**Module 5:Passive and Active Current mirrors** Basic current mirrors, Cascade mirrors, active current mirrors, Frequency Response: CS stage, Source follower, Common gate stage, Cascade stage and Difference pair.	7
VI		**Module 6:Operational Amplifiers** Design of 2-stage operational amplifier, gain boosting, Common mode feedback, Input range limitations, Slew rate, Power supply rejection ratio.	7

Text Books	
1	Behzard Razavi, Design of Analog CMOS Integrated Circuits, , TATA McGraw-Hill Publication, Eight Edition onwards (2005)
2	

References	
1	R. Jacob Baker, CMOS, Circuit Design, Layout and Simulation, Wiley-Inter- science, (2008)
2	Allen, P.E. and Holberg, D.R., CMOS Analog Circuit Design, Oxford University Press (2002).
3	Web-sites: vlsi.expert.com, testbench.in, asic-world.com

Useful Links	
1	NPTEL Lectures
2	

CO-PO Mapping

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

Assessment

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course

Bloom's Taxonomy Level		T1	T2	ESE	Total
1	Remember				
2	Understand				
3	Apply	20	10	30	**60**
4	Analyze			30	**30**
5	Evaluate				
6	Create		10		**10**
Total		**20**	**20**	**60**	**100**

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

AY 2021-22

Course Information

Programme	M.Tech. (Electronics Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5EN525
Course Name	Professional Elective 4 -Robotics and Artificial Intelligence
Desired Requisites:	Nil

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 2**			

Course Objectives

1	To become familiar with basic principles of AI toward problem solving, inference, perception, and learning.
2	To enlight the fundamentals of robotic systems.
3	To explain the basics of robot, robot Transformations and Sensors, Micro/Nano robotic systems.
4	

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	Apply basic principles of AI in solutions that require problem solving, perception, knowledge representation and learning	Apply
CO2	Understand the basic components of robots and its applcations	Understand
CO3	Design intelligent robots using sensors.	Evaluate
CO4		

Module	Module Contents	Hours
I	**Artificial Intelligence**: Introduction, Applications- Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems. AI techniques- search knowledge, abstraction.	4
II	**Problem Solving:** State space search; Production systems, search space control, depth-first, breadth-first search.	8

	Heuristic search - Hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction problems, Means-End Analysis. LA* Algorithm, L-AO*Algorithm.	
III	**Knowledge Representation and Learning :** Knowledge Representation issues, first order predicate calculus, Horn Clauses, Resolution, Semantic Nets, Frames, Partitioned Nets, Procedural Vs Declarative knowledge, Forward Vs Backward Reasoning. Learning: Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets. Handling uncertainties: Non-monotonic reasoning, Probabilistic reasoning, and Fuzzy logic.	8
IV	**Robotics:** Fundamentals of Robotics, Robot Kinematics: Position Analysis, Dynamic Analysis and Forces, Robot Programming languages & systems: Introduction, requirements of a robot programming language.	4
V	**Robot Transformations and Sensors:** Robot kinematics-Types- 2D, 3D Transformation-Scaling, Rotation, Translation, Homogeneous coordinates, multiple transformation-Simple problems. Sensors in robot – Touch sensors-Tactile sensor – Proximity and range sensors – Robotic vision sensor-Force sensor, Light sensors, Pressure sensors.	8
VI	**Robot cell Design and Micro/nano Robotics System:** Robot work cell design and control-Sequence control, Operator interface, Safety monitoring devices in Robot, Mobile robot working principle, Robot applications, Micro/ Nano robotics system overview, Biomimetic robot, Swarm robot, Nano robot in targeted drug delivery system.	8

Text Books	
1	Elaine Rich, Kevin Knight, Shivashankar B Nair, Artificial Intelligence, , Tata McGraw Hill Publishing Company Limited, Third edition 2009
2	N.J. Nilsson, “Principles of AI”, Narosa Publ. House, 1990
3	Craig. J. J. “Introduction to Robotics mechanics and control”, Addison- Wesley,1999.
4	

References	
1	Stuart Russell and Peter Norvig, Artificial Intelligence – A Modern Approach, Prentice Hall Series, Third Edition 2010
2	S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education., 2009
3	Groover M P, Industrial Robotics, Mc Graw Hill Ltd.
4	Jazar, Theory of Applied Robotics, Springer

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

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

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

Assessment
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6..

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	10	10	20	**40**
3	Apply	10	10	20	**40**
4	Analyze				
5	Evaluate			20	**20**
6	Create				
Total		**20**	**20**	**60**	**100**

Walchand College of Engineering, Sangli *(Government Aided Autonomous Institute)*					
AY 2021-22					
Course Information					
Programme	M. Tech. (Electronics Engineering)				
Class, Semester	First Year M. Tech., Semester II				
Course Code	5EN526				
Course Name	Professional Elective 4-Embedded Linux System Design				
Desired Requisites:	Embedded Linux Programming				
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 2**			
Course Objectives					
1	To facilitate students to learn the web technology on embedded Linux platform.				
2	To help the students design static and dynamic website for solving social problems using embedded Linux and web framework.				
3	To help the students to write device driver on embedded Linux for controlling simple hardware.				
Course Outcomes (CO) with Bloom's Taxonomy Level					
At the end of the course, the students will be able to,					
CO1	**Design** a website using a frontend, backend languages/ scripts and framework.				Understand

CO2	**Connect** embedded system with front end / back end using EL	Analyze
CO3	**Design** and **develop** web based solution for social problems using the EL	Create
CO4	**Build** a simple device driver for controlling hardware	Create

Module	Module Contents	Hours
I	**Introduction to web technology: -** Fundamentals of Web technology, Web server, Web Client, Server and client side scripting. Installation of Web server on EL boards and accessing them over intranet, Basics of HTML.	4
II	**Web Programming: -** HTML and CSS, Using web server for static content, Responsive site basics, Bootstrap, Php scripting for server side programming, Handling hardware through php, python. Fundamentals of database, Database design techniques, Design of dynamic web content using PHP with interface to sensors and actuators	7
III	**Web Design Framework: -** PHP Frameworks Code igniter, Helper, Libraries, Session, Process of online site hosting, Send email messages directly from the RPi and utilize them as a trigger for web services such as IFTTT. Integrating payment gateway for in EL based systems**.**	7
IV	**Embedded Linux based System Design: -** System Design based on Embedded Linux using Web Technology. Design for various online socially relevant systems. Systems engineering for online systems based on EL. System implementation using Raspberry Pi / Beagle Bord	8
V	**Linux Device Driver:-** Device driver fundamentals, Kernel Programming for Device driver design, Building the environment, Implementing the driver, Setting up the ports/Hardware, Compiling the driver, Loading the driver into the kernel, Using the driver, device driver programming	7
VI	**Applications: -** Case study on embedded Linux system design for web based technology.	6

Text Books	
1	Robin Nixon, *Learning PHP, MySQL & JavaScript*, O'Reilly publication, 4th Edition, 2015, ISBN: 9789352130153
2	Kogent Learning Solutions Inc, *Web Technologies: HTML, JAVASCRIPT, PHP*, Dreamtech Press (2009) ISBN: 978-8177229974
3	John Madieu, *"Linux Device Drivers Development",* Ed. 1 2017, ISBN: 9781785280009

References	
1	*"Embedded Linux Device drivers",* https://lwn.net/Kernel/LDD3/
2	*"Web Technology",* https://www.geeksforgeeks.org/web-technology/#beginning
3	Dr. Sudip Misra, NPTEL Course: "*Introduction to Internet of Things*", IIT Kharagpur. https://onlinecourses.nptel.ac.in/noc17_cs22/preview

Useful Links	
1	https://www.edx.org/
2	https://www.udacity.com/
3	https://www.coursera.org/
4	https://www.kernel.org/

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

CO3			2												
CO4				2									1	1	

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

Assessment
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	10		20	**30**
3	Apply	10	10	20	**40**
4	Analyze				
5	Evaluate				
6	Create		10	20	**30**
Total		**20**	**20**	**60**	**50**

Walchand College of Engineering, Sangli

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Course Information					
Programme	M.Tech. (Electronics Engineering)				
Class, Semester	First Year M.Tech., Sem II				
Course Code	5EN575				
Course Name	Activity based Lab Professional Elective 3 Image Processing and Pattern Recognition Lab				
Desired Requisites:	Digital Image Processing				
Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2 Hrs/week	Nil			
Interaction	-	**Credits: 1**			

Course Objectives	
1	To understand the Product Development Process through Mini Project.
2	To understand budgeting through Mini project

3	To use Image Processing and Pattern Recognition Algorithms	
4	To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.	
Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO 1	Describe different techniques used for image analysis	Understanding
CO 2	Apply both supervised and unsupervised clasification methods to detect and characterize patterns in real-world data	Applying
CO 3	Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers.	Creating

Mini Project Guideline

1. The students must should learn following concepts before planning Mini Project
   a. Basic point processing operations in MATLAB
   b. Image Transformation Methods
   c. Spatial Filtering on images
   d. Edge detection algorithms
   e. Morphological image processing algorithms and its applications
   f. Object Detection Algorithms
   g. Classification and Clustering Algorithms
   h. Introduction to Computer Vision Toolbox

2. In discussion with the concerned faculty during Laboratory hours Student should plan the Mini project and prepare synopsis

3. The progress of work and discussion must be documented.

4. Testing of final system, Preparation, Checking & Correcting be done in discussion with faculty

5. The Student must submit a brief project report(25-30 pages) that must include the following
   a. Introduction
   b. Literature survey
   c. Hardware & Software Requirements
   d. System Design Architecture
   e. Implementation (screenshots to be included)
   f. Testing
   g. Conclusion
   h. Future enhancements.
   j. Bibliography

Text Books

1	Earl Gose and Richard Johnsonbaugh Steve Jost, "Pattern Recognition and Image Analysis", PHI publication
2	Sing Tze Bow, M. Dekker, "Pattern Recognition and Image Processing", Springer, 1992
3	

References

1	Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Addinson – Wesley.

2	C.M.Bishop, “Pattern Recognition & Machine Learning”, Springer, 2006
3	

Useful Links	
1	https://www.coursera.org/
2	
3	
4	

CO-PO Mapping

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

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.

Assessment Plan based on Bloom’s Taxonomy Level (Marks) (For lab Courses)

Bloom’s Taxonomy Level	LA1	LA2	Lab ESE	Total
Remember				
Understand	15			**15**
Apply	15	20	20	**55**
Analyze				
Evaluate				
Create		10	20	**30**
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

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Course Information

Programme	M.Tech. (Electronics Engineering)
Class, Semester	First Year M.Tech., Sem II
Course Code	5EN576
Course Name	Activity based Lab Analog VLSI Design
Desired Requisites:	None

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2 Hrs/week	Nil			
Interaction	-	**Credits: 1**			

Course Objectives

1	To understand the Product Development Process through Mini Project.
2	To understand budgeting through Mini project
3	To Cadence EDA tools for designing and simulating analog CMOS circuits
4	To CMOS analog circuits and design single stage CS, CG, CD, differential amplifiers and 2-stsge Operational amplifier for given specifications
5	To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO 1	**Analyze** MOS transistors by characterizing them for targeted value of gm or drain current for designing the physical dimensions and the required gate bias using Cadence EDA tools	Analyze
CO 2	**Explain** and demonstrate the complete flow of Cadence tools from schematic to symbol generation to simulation for CS, CG, CD and differential amplifiers	Demonstrate
CO 3	**Build** and evaluate by simulating the single stage amplifier circuits (CS, Source Follower, Cascode stage, differential pair etc.) using MOSFETs schematic design entry for various loads and relate the gain values with theoretical expressions.	Evaluate
CO 4	**Design** differential pair circuits with active current mirror load for given gain and UGB.	Create

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

11. The students must understand following aspects while planning Mini Project
    a. Concept of Cadence EDA tools for designing and simulating analog CMOS circuits
    b. CMOS analog circuits and design single stage CS, CG, CD, differential amplifiers and 2-stsge Operational amplifier for given specifications.
    c. To characterize the transistors for the voltage conditions seen by the circuit with goal of optimizing dimensions for given ID or trans-conductance.
    b. Importance
    c. Interdisciplinary
    d. Challenges
    e. Various applications/smart objects
    f. Major Players/Industry, Standards.

12. In discussion with the concerned faculty during Laboratory hours Student should plan the Mini project and prepare synopsis

13. The progress of work and discussion must be documented.

14. Testing of final product, Preparation, Checking & Correcting be done in discussion with faculty

15. The Student must submit a brief project report(25-30 pages) that must include the following
    a. Introduction
    b. Literature survey
    c. Hardware & Software Requirements
    d. System Design Architecture
    e. Implementation (screenshots to be included)
    f. Testing
    g. Conclusion
    h. Future enhancements.
    j. Bibliography

Text Books	
1	Behzard Razavi, Design of Analog CMOS Integrated Circuits, , TATA McGraw-Hill Publication, Eight Edition onwards (2005)
2	
References	
1	R. Jacob Baker, CMOS, Circuit Design, Layout and Simulation, Wiley-Inter- science, (2008)
2	Allen, P.E. and Holberg, D.R., CMOS Analog Circuit Design, Oxford University Press (2002).
3	Web-sites: vlsi.expert.com, testbench.in, asic-world.com
Useful Links	
1	NPTEL Lectures
2	

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

CO3			2			3							3		
CO4				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.															

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand				
3	Apply	20	10	30	**60**
4	Analyze			30	**30**
5	Evaluate				
6	Create		10		**10**
Total		**20**	**20**	**60**	**100**

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply	15		20	**35**
Analyze	15	10	10	**35**
Evaluate		10	10	**20**
Create		10		**10**
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

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Course Information	
Programme	M.Tech. (Electronics Engineering)
Class, Semester	First Year M.Tech., Sem II
Course Code	5EN577
Course Name	Elective 4 -Activity based lab Robotics and Artificial Intelligence
Desired Requisites:	None

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical 2 Hrs/week		Nil			

Interaction	-	Credits: 1

Course Objectives	
1	To use artificial intelligence algorithms to design robot..
2	To understand the design Process through Mini Project.
3	To understand budgeting through Mini project
4	To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO1	Identify the components to design robot for particular task	Apply
CO2	Build the designed application.	Create
CO3	Test the project for different test cases	Evaluate
CO4	Present the work carried out	Analyze

Guidelines for Mini Project

6. The students must understand following aspects while planning Mini Project
   a. Concept of algorithms to insert artificial intelligence.
   b. Need of sensors, positioning in robotics
   c. Problem identification
   d. Design parameters in selection of components
   e. Student should plan the Mini project and prepare synopsis in discussion with the concerned faculty

7. The progress of work and discussion must be documented.

8. Analysis and testing of intermediate steps of product
9. The Student must submit a brief project report(15-20 pages) that must include the following points
   a. Introduction
   b. Literature survey
   c. Hardware & Software Requirements
   d. System Design
   e. Implementation (screenshots to be included)
   f. Testing
   g. Conclusion
   h. Future enhancements.
   j. Bibliography

Text Books	
1	Jain N, Artificial Intelligence: making a system intelligent, 2018, ISBN: 9788126579945
2	
References	
1	J. Norberto Pires, Altino Loureiro and Gunnar Bölmsjo, _Welding Robots -

	Technology,System Issues and Applications_, Springer-Verlag 2006, ISBN-10:1852339535
2	3. Ben-Zion Sandler, _Robotics: Designing the Mechanisms for Automated Machinery_, 2nded. 1999 by Academic Press, ISBN 0-12-618520-4
Useful Links	
1	**https://nptel.ac.in/**
2	**https://www.coursera.org/**

CO-PO Mapping

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

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

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

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	**Based on**	**Conducted by**	**Typical Schedule (for 26-week Sem)**	**Marks**
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)				
Bloom's Taxonomy Level	**LA1**	**LA2**	**Lab ESE**	**Total**
Remember				
Understand				
Apply	15			**15**
Analyze	15	10		**25**
Evaluate		10	20	**30**
Create		10	20	**30**
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

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AY 2021-22

Course Information	
Programme	M.Tech. (Electronics Engineering)
Class, Semester	First Year M.Tech., Sem II
Course Code	5EN578
Course Name	Activity based lab Professional Elective 4 Embedded Linux System Design
Desired Requisites:	None

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	-	**LA1**	**LA2**	**ESE**	**Total**
Tutorial	-	30	30	40	100
Practical	2 Hrs/week	Nil			
Interaction	-	**Credits: 1**			

Course Objectives	
1	To understand the Product Development Process through Mini Project.
2	To understand budgeting through Mini project
3	To use Embedded Linux
4	To learn system Architecture, configuration and Programming
5	To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO 1	**Identify** the requirements for the real world problems	Analyze
CO 2	**Understand** and plan mini project based on Robotice and AI or Embedded Linux	Apply
CO 3	**Design** and build the project successfully	Design
CO 4	**Deliver** technical seminar based on the Mini Project work carried out.	Create

Mini Project Guideline

6. The students must understand following aspects while planning Mini Project
   a. Concept of Front End and Back End Design, Web environment setup and integrating web technology with Linux based embedded system
   b. Importance
   c. Interdisciplinary
   d. Challenges
   e. Various applications/smart objects
   f. Major Players/Industry, Standards.

7. In discussion with the concerned faculty during Laboratory hours Student should plan the Mini project and prepare synopsis

8. The progress of work and discussion must be documented.

9. Testing of final product, Preparation, Checking & Correcting be done in discussion with faculty

10. The Student must submit a brief project report(25-30 pages) that must include the following
    a. Introduction
    b. Literature survey
    c. Hardware & Software Requirements
    d. System Design Architecture
    e. Implementation (screenshots to be included)
    f. Testing
    g. Conclusion
    h. Future enhancements.
    j. Bibliography

Text Books	
1	Robin Nixon, *Learning PHP, MySQL & JavaScript*, O'Reilly publication, 4th Edition, 2015, ISBN: 9789352130153
2	Kogent Learning Solutions Inc, *Web Technologies: HTML, JAVASCRIPT, PHP*, Dreamtech Press (2009) ISBN: 978-8177229974
3	John Madieu, *"Linux Device Drivers Development",* Ed. 1 2017, ISBN: 9781785280009
References	
1	*"Embedded Linux Device drivers",* https://lwn.net/Kernel/LDD3/
2	*"Web Technology",* https://www.geeksforgeeks.org/web-technology/#beginning
3	Dr. Sudip Misra, NPTEL Course: "*Introduction to Internet of Things*", IIT Kharagpur. https://onlinecourses.nptel.ac.in/noc17_cs22/preview
Useful Links	
1	https://www.edx.org/
2	https://www.udacity.com/
3	https://www.coursera.org/
4	https://www.kernel.org/

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

Assessment

There are three components of lab assessment, LA1, LA2 and Lab ESE.
IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation.

Assessment	Based on	Conducted by	Typical Schedule (for 26-week Sem)	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 6 Marks Submission at the end of Week 6	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 7 to Week 12 Marks Submission at the end of Week 12	30
Lab ESE	Lab activities, attendance, journal	Lab Course Faculty	During Week 15 to Week 18 Marks Submission at the end of Week 18	40

Week 1 indicates starting week of a semester. The typical schedule of lab assessments is shown, considering a 26-week semester. The actual schedule shall be as per academic calendar. 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.

Assessment Plan based on Bloom's Taxonomy Level (Marks) (For lab Courses)

Bloom's Taxonomy Level	LA1	LA2	Lab ESE	Total
Remember				
Understand				
Apply	15			**15**
Analyze	15	10		**25**
Evaluate		10	20	**30**
Create		10	20	**30**
Total Marks	**30**	**30**	**40**	**100**

Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information

Programme	M.Tech. (Electronics Engineering)
Class, Semester	First Year M.Tech., Sem II
Course Code	5OE108

Course Name	Open Elective - Introduction to Embedded Systems
Desired Requisites:	None

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-	Nil			
Interaction	-	**Credits: 2**			

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

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, the students will be able to,		
CO 1	**Understand** Embedded Systems and Identify their applications	Apply
CO 2	**Develop** knowledge about hardware and software of Embedded Systems	Apply
CO 3	**Analyze** Arduino based systems and their programming	Analyze
CO 4	**Explore** and learn Arduino based systems applications	Apply

Module	**Module Contents**	**Hours**
I	**Module 1 Introduction** Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems Characteristics and Applications of embedded systems: operational and non-operational quality attributes. Embedded Systems Applications-Application specific – washing machine, domain specific - automotive	4
II	**Module 2 Core of embedded systems** Microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components.	5
III	**Module 3 Embedded Hardware** Memory map, i/o map, interrupt map, processor family, external peripherals, memory – RAM , ROM, types of RAM and ROM, memory testing, CRC ,Flash memory. **Peripherals:** Control and Status Registers, Device Driver, Timer Driver - Watchdog Timers	5

IV	**Module 4 Introduction to Arduino** Arduino device,Features of Arduino, Components of Arduino board,Description of Microcontrollers, Installation of Arduino IDE on Ubuntu Linux OS Run the arduino executable file, Using IDE to prepare Arduino sketch, Uploading and running the sketch,Program notation: variables, functions, control flow, Arduino conventions.The concept of a program variable.Numerical values and basic numerical operators.if/then/else Iteration using for loops.Real world timing and the delay() function	5
V	**Module 5 Input/Ouput Progrmming** Sensor Inputs:- Definition, Types. Interfacing arduino to different sensors- light sensor, temperature sensor, humidity sensor, pressure sensor sound sensor, distance ranging sensor, water/detector sensor, smoke, gas, alcohol sensor, ultrasonic range finder Displays: Basics of LED's and LCD's. Interfacing arduino to LED's- blinking single LED, blinking multiple LED's, 7 segment display , traffic light ,LED flashes ,LED dot matrix ,pulsating lamp. Interfacing to LCD's- Basic LCD control, LCD temperature control, display a message on LCD screen, scrolling of text Touch screens, Reading and writing to SD card	5
VI	**Module 6 Arduino Applications** Case studies : Arduino based robot car , Arduino based PLC, industrial application	4

Text Books	
1	Shibu K V , "Introduction to embedded systems", Tata Mcgraw-Hill, 1st edition
2	"Arduino Cookbook,"Michael Margolis

References	
1	"Embedded Systems", Rajkamal, Tata Mcgraw-Hill
2	"Beginning Arduino", Michal Mc Roberts, Second Edition
3	Michal Mc Roberts "Beginning Arduino" Second Edition, Technology in Action

Useful Links	
1	NPTEL Lectures
2	

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

CO1			2										3		
CO2						3								3	
CO3			3			2							3		
CO4				2		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.															

Assessment
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level					
Bloom's Taxonomy Level	**ISE1**	**MSE**	**ISE2**	**ESE**	**Total**
Remember					
Understand					
Apply	10	30		30	**70**
Analyze			10	20	**30**
Evaluate					
Create					
Total	**10**	**30**	**10**	**50**	**100**

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Course Information	
Programme	M. Tech. (Electronics Engineering)
Class, Semester	First Year M. Tech., Sem II
Course Code	5IC501
Course Name	Value Education
Desired Requisites:	

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	2 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				

Interaction	-	Credits: 0

Course Objectives	
1	To impart knowledge on value of education and self- development.
2	To imbibe good values in students.
3	To highlight importance of character.

Course Outcomes (CO) with Bloom's Taxonomy Level		
At the end of the course, students will be able to,		
CO 1	Explain value of education and self- development.	Understand
CO 2	Summarize importance of good character, and Behaviour development.	Evaluate

Module	Module Contents	Hours
I	Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism, Moral and non-moral valuation. Standards and principles, Value judgments.	6
II	Importance of cultivation of values, Sense of duty. Devotion, Self-reliance, confidence, Concentration. Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline.	6
III	Personality and Behaviour Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour universal brotherhood and religious tolerance, True friendship, Happiness vs. suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature	7
IV	Character and Competence –Holy books vs. Blind faith, Self-management and Good health, science of reincarnation, Equality, Nonviolence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control. Honesty, Studying effectively	7

Text Books	
1	Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

References	
1	

Useful Links	
1	https://nimsuniversity.org/wp-content/uploads/2018/02/Value-Education-Human-Rights-and-Legislative-Procedures.pdf
2	http://cbseacademic.nic.in/web_material/ValueEdu/Value%20Education%20Kits.pdf
3	https://www.verywellmind.com/personality-development-2795425
4	https://trudreadz.com/2019/09/10/blind-faith-in-religion-destroys-our-ability-to-critically-think-for-ourselves/

CO-PO Mapping						
	Programme Outcomes (PO)					
	1	2	3	4	5	6
CO 1	2				1	2

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

Assessment (for Theory Course)
The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3,4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	10	10	30	50
3	Apply				
4	Analyze				
5	Evaluate	10	10	30	50
6	Create				
Total		**20**	**20**	**60**	**100**