Government College of Engineering, Karad

(An Autonomous Institute of Government of Maharashtra)

Programme: Electronics and Telecommunication Engineering

Curriculum for
Third year of B. Tech

Programme Educational Objectives (PEOs):

1. To motivate the students for pursuing higher education from renowned organizations, leading to Research & Development in core technical area.
2. To encourage students to participate in Social activities & utilize engineering knowledge to fulfil socio-ethical problems for Rural development & Regional needs of technology.
3. To prepare students with core Technical competency, Soft skills, Leadership quality & demonstrate an ability to work in multi-disciplinary fields.
4. To be able to acquire state of art knowledge to cater the Industry employability needs & to motivate students to enter in the field of Entrepreneurship.

Programme Outcomes (POs):

PO	Nomenclature	Definition (After successful completion of Electronics and Telecommunication Engineering program, student will able to:)
PO1	a	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	b	**Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	c	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	d	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	e	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	f	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	g	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	h	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	i	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	j	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	k	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these

		to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	l	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSOs):

PSO	Nomenclature	Definition
PSO1	m	A student should be able to demonstrate skills in analyzing and debugging any malfunctioning or errors of a pre-existing electronic/computer hardware or software systems for employability in core/IT sector.
PSO2	n	Design, Simulate and develop computer based prototype system for applications including Signal processing, Communication, Computer networks with free ware open source software platforms.

Government College of Engineering Karad
Third Year B. Tech.
EX501: Digital Communication

Teaching Scheme		Examination Scheme	
Lectures	4 Hrs/week	**CT1**	15
Tutorials	--	**CT2**	15
Total Credits	4	**TA**	10
		ESE	60
		Duration of ESE	2 Hrs 30 min

Course Objectives : The student should be able to

1. Identify the basic fundamentals of Digital communication systems.
2. Analyse the issues such as coding, multiple access, error probability, algorithms for Digital communication systems.
3. Impart the knowledge of design, analysis & comparison of Digital communication systems.
4. Develop methods to simulate and modify the Digital communication systems.

Course Contents **Hours**

Unit I **Information Theory** 10

Uncertainty, Information and Entropy, Mutual Information, Channel Capacity, Shannon Hartley Theorem, Source coding Theory, Huffman coding and Shannon-Fanon Coding.

Unit II **Channel Coding** 10

Error detection and correction, Types of codes, Linear block codes, Hamming code, Cyclic codes, Convolution codes.

Unit III **Digital Modulation Techniques** 10

Digital Band pass Modulation techniques such as ASK, FSK, BPSK, QPSK, QAM. Coherent and non-coherent detection, M-ary Modulation Techniques-M-ary PSK.

Unit IV **Baseband Pulse Transmission** 10

Line coding, Pulse shaping, Inter-symbol interference (ISI), Eye pattern, Scrambler, introduction to optimum filter and matched filter.

Unit V **Probability** 10

Probability and sample space, Conditional Probability, CDF, PDF, Statistical Averages, Probability models.

Course Outcome (CO) : Upon successful completion of this course, the student will be able to

1. Apply knowledge of mathematics, science and engineering in the design of digital communication circuits and systems.
2. Distinguish the baseband transmission techniques with operation and working.
3. Analyse the different coding technique for design and modelling of digital communication Systems.
4. Perform experiments for testing digital communication circuits and systems.

Text Books

1 Bernard Sklar, "Digital Communications (Fundamentals and applications)", Pearson Education Asia, Second Edition, 2013.
2 Lathi, B.P. and Ding, Z., "Modern Digital and Analog Communication Systems", Oxford University Press, 4thEdition, 2009.

References

1 Simon Haykin, "Digital Communication", Wiley Eastern, Student Edition, 2004.
2 K. N. Hari Bhat and D. Ganesh Rao, "Digital Communications – Theory and Lab Practice", Pearson Education, 3rdEdition, 2013.
3 V. Chandra Sekar, "Communication Systems", Oxford University Press, Student Edition, 2010.
4 Carlson, A.B., Crilly, P.B. and Rutledge, J.C., "Communication Systems: An Introduction to Signals and Noise in Electrical Communication", McGraw-Hill, 4thEdition, 2002.
5 Dr. Sanjay Sharma, "Communication Systems (Analog and Digital)", New A. S. Printing Press Delhi, 6thEdition,2013.
6 Roddy, D., and Coolen, J., "Electronic Communication", Dorling Kindersley (India), 4thEdition,2009.

Useful Links

1 http://www.satishkashyap.com/2013/03/video-lectures-on-digital.html
2 http://www.nptelvideos.in/2012/12/digital-communication.html
3 https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-450-principles-of-digital-communications-i-fall-2006/video-lectures/

Mapping of CO and PO

	PO												PSO	
	a	**b**	**C**	**d**	**e**	**f**	**g**	**h**	**i**	**J**	**k**	**l**	**m**	**n**
CO1	√	√	√		√							√	√	√
CO2	√			√	√							√		
CO3	√	√	√		√							√	√	
CO4	√	√	√	√	√				√	√		√	√	√

Assessment Pattern

Knowledge Level	**CT1**	**CT2**	**TA**	**ESE**
Remember	√	√	√	√
Understand	√	√	√	√
Apply	√	√	√	√
Analyze	√	√	√	√
Evaluate	√	√	√	√
Create				
Total	15	15	10	60

Government College of Engineering Karad
Third Year B. Tech.
EX502: Embedded Systems

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hrs/week	**CT1**	15
Tutorials	--	**CT2**	15
Total Credits	3	**TA**	10
		ESE	60
		Duration of ESE	2 Hrs 30 min

Course Objectives : The student should be able to

1 Classify controller and processor and state various applications of controller.
2 Explain and identify the architecture of ARM processor.
3 Understand and implement the instruction set for ARM processor.
4 Understand Real-time systems and its applications.

Course Contents		**Hours**
Unit I	**ARM Embedded Systems** Overview of Microcontroller, The RISC Design Philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software.	07
Unit II	**ARM Processor Fundamentals** Registers, Current Program Status Registers (CPSR), Pipeline, exceptions, Interrupts and the vector table, core extensions, architecture revision, Arm Processor Families.	07
Unit III	**Efficient C Programming** Overview of C Compilers and Optimization, Basic C Data Types, C Looping Structures, Register Allocation, Function Calls, Pointer Aliasing, Structure Arrangement, Bit-fields, Unaligned Data and Endianness, Division, Floating Point, Inline Functions and Inline Assembly, Portability Issues.	06
Unit IV	**Exception and Interrupt Handling** Exception Handling, Interrupts, Interrupt Handling Schemes.	04
Unit V	**Interprocess Communication and Synchronization of Processes, Threads and Tasks** Multiple Processes in an application, Multiple Threads in an application, Tasks, Task States, Task and Data, Clear-cut distinction between Functions, ISRS and tasks by their Characteristics, Concept of Semaphores, Shared Data, Interprocess Communication, Signal Function, Semaphore Functions, Message Queue Functions, Mail Box Functions, Pipe Functions, Socket Functions, Message Queue Functions, Mail Box Functions, Pipe Functions, Socket Functions, RPC Functions.	06
Unit VI	**Real world interfacing using LPC 21XX**	06

LED interfacing, switch interfacing, stepper motor interfacing, digital -input output interfacing, Programming on I2c & SPI bus Protocol.

Course Outcome (CO) : Upon successful completion of this course, the student will be able to

1 Program, test and debug code using Keil software.
2 Execute programs with hardware and software tools.
3 Demonstrate interfacing of various physical real world devices.

Text Books

1 Andrew Sloss, *"ARM System Developer's Guide",* Elsevier Inc., Morgan Kaufmann publication, Student Edition, 2004.
2 Raj Kamal, *"Embedded Systems- Architecture, Programming and Design",* The McGraw-Hill companies, 2nd Edition, 2011.

References

1 By Frank Vahid, Tony Givargis, *"Embedded System Design",* Wiley Publication, 2nd Edition, 2002.
2 Programming technique ARM DUI 0021A.
3 Datasheet of LPC214XX
4 I2C, EEPROM, RTC data sheets.

Useful Links

1 www.arm.com
2 www.ti.com
3 https://www.youtube.com/watch?v=y9RAhEfLfJs
4 http://nptel.ac.in/courses/108102045/

Mapping of CO and PO

	PO												PSO	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**N**
CO1	√	√		√					√			√		
CO2	√				√							√		
CO3	√	√	√			√			√		√	√	√	√

Assessment Pattern

Knowledge Level	**CT1**	**CT2**	**TA**	**ESE**
Remember			√	√
Understand	√	√	√	√
Apply	√	√	√	√
Analyze			√	√
Evaluate	√	√		√
Create		√	√	√
Total	15	15	10	60

Government College of Engineering Karad
Third Year B. Tech
EX503:Digital Signal Processing

Teaching Scheme		**Examination Scheme**	
Lectures	4Hrs/week	**CT1**	15
Tutorials	--	**CT2**	15
Total Credits	4	**TA**	10
		ESE	60
		Duration of ESE	2 Hrs 30 min

Course Objectives : The student should be able to

1. Classify and understand the concepts of DTFT and DFT.
2. Implement and design FIR and IIR filters as per applications.
3. Implement the FIR and IIR Filters structures using block schematics.
4. Identify and apply use of Fourier Transforms in Discrete Frequency domain.
5. Understand and describe the hardware DSP Processor.

Course Contents **Hours**

Unit I **Discrete Time Fourier Transform.** 6

Discrete Time Signals and Systems in the time domain, typical signals, sampling process, time domain characterization of LTI DTS, DTFT and its Properties.

Unit II **Discrete Fourier Transform** 8

Discrete Time Signals in frequency domain. Introduction to DFT, Properties of DFT, Computation methods. Linear Convolution using DFT and Z-Transform. Concept of circular convolution. FFT, Overlap Save and Overlap add algorithm. Relationship between DTFT, DFT and ZT. FFT Algorithms – Radix 2: DIT-FFT and Radix 2: DIF.

Unit III **FIR Filter Design and IIR Filter Design.** 8

Characteristics of FIR Filters. Properties of FIR Filters. FIR Design using Frequency Sampling Technique and Windowing methods. Introduction to IIR Filters, IIR Filter Designing using Impulse Invariant method and Bilinear Transformation method, Butterworth Filter approximation, Frequency Transformation.

Unit IV **Realization of FIR and IIR Filters** 7

Introduction, Basic realization blocks diagram. FIR realization- Direct Form (Non-linear phase and Linear phase), Cascade and Parallel realization. IIR realization- Direct form I and II, Cascade and parallel realization.

Unit V **DCT and Wavelet Transform** 8

Forward DCT, Inverse DCT and DCT as orthogonal transformation.

Introduction to wavelets, time frequency representations, STFT, continuous time wavelet, Continuous wavelet transform (CWT), Inverse CWT, Properties of CWT, Discrete wavelet transform, Comparison of Fourier transform & wavelet transform, Application of wavelets transforms.

Unit VI **DSP Processors.** 7

Introduction, Architecture of DSP Processor, TMS 320C67XX specifications, Comparison between general purpose and DSP processors.

Course Outcome (CO) : Upon successful completion of this course, the student will be able to

1 Apply DFT as an analytical tool.
2 Analyze LTI Systems using FFT algorithms.
3 Design FIR and IIR systems.
4 Implement FIR and IIR Systems.
5 Implement various DSP Systems on DSP Processor.

Text Books

1 S.K.Mitra, *"Digital Signal Processing",* Tata McGraw Hill, 3rd Edition, 2008.
2 P. Ramesh Babu, *"Digital Signal Processing",* SciTech publication, 4th Edition, 2010.
3 Proakis, *"Digital Signal Processing",* TMG publication, 4th Edition, 2012.

References

1 Shalivan and vallavraj, *"Digital Signal Processing",* TMG publication,Student Edition, 2007.
2 E. C. Ifeachor, Barrie W. Jervis, *"Digital Signal Processing",* Prentice Hall, Technology & Engineering, 3rd Edition, 2002.
3 Ashok Ambardar, *"Digital Signal Processing",* Cengage learning, 1st Edition, 2009.
4 Texas Instruments DIP Processor data sheet.
5 Oppenheim scheffer, *"Discrete Time Signal Processing",* Pearson Publication, 2nd Edition, 1998.

Useful Links

1 https://www.youtube.com/playlist?list=PLB75F3DF81054644C
2 https://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/video-lectures/
3 https://www.youtube.com/watch?v=Eknlx7zHBVo
4 https://www.youtube.com/watch?v=4ufeTZ6fSNY

Mapping of CO and PO

	PO												PSO	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**N**
CO1	√	√	√		√				√			√	√	
CO2	√	√		√									√	
CO3	√	√	√	√						√				√
CO4			√		√				√					√
CO5			√		√				√					√

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember				√
Understand		√	√	√
Apply	√	√	√	√
Analyze	√	√	√	√
Evaluate	√		√	√
Create		√	√	√
Total	15	15	10	60

Government College of Engineering Karad
Third Year B. Tech
EX504: Control Systems

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hrs/week	**CT1**	15
Tutorials	--	**CT2**	15
Total Credits	3	**TA**	10
		ESE	60
		Duration of ESE	2 Hrs 30 min

Course Objectives : The student should be able to

1. Impart the knowledge of fundamental concepts of control systems and mathematical modelling of the system.
2. Investigate time response and frequency response of the system and to use for stability & analysis of the system.
3. Understand various systems exhibiting control mechanisms and their operation.
4. Examine basic concepts of different controllers.

Course Contents **Hours**

Unit I **Introduction to Control Systems** 6

Need of Control Systems, Types of control systems, Transfer Function, Block Diagram and Signal Flow Graph, Mathematical Modelling of physical systems such as – Electrical and Mechanical.

Unit II **Time Domain Analysis** 6

Standard test signals – Time response of first& second order systems –Design specifications of 2^{nd} order system & error compensation, Characteristic Equation of Feedback control systems, Transient response of second order systems – Time domain specifications, Steady state response – Steady state errors and error constants.

Unit III **Stability concepts** 6

The concept of stability & Necessary condition of stability Hurwitz stability criterion, Routh stability criterion, Relative stability analysis.

Unit IV **Root Locus Technique** 6

Definition of root locus, Rules for plotting root loci, Root contour, stability analysis using root locus. Effect of addition of poles and zeros.

Unit V **Frequency domain analysis** 7

Introduction, Frequency domain specifications-Bode plots, Determination of Frequency domain specifications and transfer function from the Bode Plot – Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Stability Criterion, Nyquist plot & stability analysis.

Unit VI **State Variable Analysis and Controller** 6

Concept of state, state variable & state model, Concept of Controllability and observability.

Course Outcome (CO) : Upon successful completion of this course, the student will be able to

1 Modelling of linear dynamic systems using differential equations.
2 Analyze control systems in the time and frequency domains using transfer function and state-space methods.
3 Construct Model systems from signal flow graph and evaluate the properties of the overall systems
4 Testing of real-time systems with an objective of studying its performance, stability, controllability and observability.

Text Books

1 I. J. Nagrath and M. Gopal, *"Control systems Engineering",* Anshan Ltd; 5th Revised edition, 2008.
2 B. C. Kuo, *"Automatic Control Systems",* Wiley; 8th edition, 2002.

References

1 Li Qui and Kemin Zhou, *"Introduction to Feedback Control",* Prentice Hall, StudentEdition, 2009.
2 Norman S. Nise, *"Control System Engineering",* Wiley; 7th Edition, 2014.
3 Kuo. B. C., *"Automatic Control Systems",* Prentice Hall Inc., 2ndEdition, 1962.
4 M. Gopal, *"Control Systems – Principles and Design",* Pearson Education, 3rd Edition, 2001.

Useful Links

1 http://nptel.ac.in/courses/108101037/
2 http://www.nptelvideos.in/2012/11/control-engineering.html
3 http://freevideolectures.com/Course/2337/Control-Engineering

Mapping of CO and PO

	PO												PSO	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**J**	**k**	**l**	**m**	**n**
CO1	√	√			√				√		√	√	√	
CO2	√	√	√	√					√		√	√	√	
CO3	√	√							√					
CO4	√	√	√						√		√	√		

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	√	√	√	√
Understand	√		√	√
Apply	√	√	√	√
Analyze		√	√	√
Evaluate	√	√	√	√
Create	√	√	√	√
Total	15	15	10	60

Government College of Engineering Karad
Third Year B. Tech
EX505: Mini Project using Design tools

Teaching Scheme		**Examination Scheme**	
Lectures	1 Hr/week	**CT1**	-
Practical	2 Hrs/week	**CT2**	-
Total Credits	4	**TA/CA**	50
		ESE	-

Course Objectives : The student should be able to

1 Understand and recognize the need of basic electronics system and its components.
2 Prepare schematic layout of a circuit for system design.
3 Prepare PCB artwork using design tools.
4 Understand the PCB computerized atomization process.

Course Contents		**Hours**
Unit I	**Circuit Symbol drawing:** Study of symbols of various Electronic Components, Study of ANSI/IEEE Std for Symbol drawing.	2
Unit II	**Components of Design Process:** Analysis and Design , comparison of Design and Analysis , principles of Design, Schematic diagram, How Specification arise, Limits, Standard specifications, Component specification, equipment performance specification, preparation of a test specification Design checklist, prototyping the circuit	3
Unit III	**Introduction to Basic Electronic designs:** Simple power supply with full wave rectifier and filter, Zener regulated power supply, Power supply using linear integrated circuits, square wave generation circuit, sine wave generation circuit, Voltage controller oscillator	3
Unit IV	**Introduction to PCB Design Software:** Introduction to manual PCB Designing, Schematic Entry, Netlist Creation, Working with component libraries, Design of Boards, Layout of parts, optimizing parts placements, pads and via, manual and auto routing.	4
Unit V	**Computed Aided PCB Design:** Limitations of manual design, Automated Artwork drafting, Computer aided Design, Design automation.	1
Unit VI	**Case Study:** PCB Prototyping machine.	1

Course Outcome (CO) : Upon successful completion of this course, the student will be able to

1 Design electronics systems.
2 Implement the knowledge of PCB design.
3 Create any electronic mini projects.

Text Books

1 WC Bhosshart, “Printed circuit board Technology”, TMH, Student Edition, 1989.
2 R S Khandpur, “Component Device and Technology”, TMH, Student Edition, 2005.

References

1 Martin S. Roden, “Electronic Design”, Lega books Distributions, 4th Edition, 2002.
2 Paul Horwitz, “The Art of electronics”, Cambridge university Press, 3rd Edition, 2015.
3 George Loveday, “Electronic Testing and Fault Diagnosis”, Longman Scientific and Technical, Student Edition, 1995.

Useful Links

1 www.farnell.com
2 www.Alldatasheets.com
3 www.national.com
4 www.ti.com
5 www.electronicsforu.com
6 www.electronicsforu.com
7 www.doityourself.com
8 www.diy-electronic-projects.com
9 www.electronics-diy.com
10 http://www.orcad.com/resources/orcad-tutorials
11 https://www.tina.com/tutorials
12 https://www.expresspcb.com/wp-content/uploads/formidable/ExpressPCB_7_1_Manual.pdf

List of Experiments

Experiment 1	Design of voltage to frequency conversion using PLL
Experiment 2	Design of driver circuit for Relay
Experiment 3	Design of control circuit for stepper motor
Experiment 4	Design of low voltage audio amplifier
Experiment 5	Design of SMPS Power supply with integrated chips
Experiment 6	Design of temperature sensing circuit output in the range of 4 mA to 20mA
Experiment 7	Design of inverter circuit using MOSFET
Experiment 8	Design of square wave generator using frequency multiplier
Note	Compulsory Mini project based on above practicals.
Industrial Visit	Industrial visit to nearest PCB manufacturing /Assembly plant and field report on it.

List of Submission

1 Total number of Experiments: 08
2 Total number of sheets: 01
3 Mini Project Report
4 Field Visit Report

Guidelines:

	Week 1 & 2: Formation of groups, Finalization of Mini project, and distribution of work. Week 2 & 4: PCB artwork design using an appropriate EDA tools, Simulation. Week 5 and 6: Hardware and Assembly. Week 7 & 8 Enclosure design, fabrication etc. Week 9 & 10: Preparation, checking and correcting of the draft copy and presentation. Mini project work should be carried out in the projects laboratory.
1.	Project designs ideas can be necessarily adapted from recent issues of electronic design magazines. Application notes from well-known component manufacturers may also be referred.
2.	Hardware component is mandatory.
3.	Layout versus schematic verification is mandatory.
4.	Domains for projects may be from the following, but not limited to: Instrumentation and Control Systems, Electronic Communication Systems, Biomedical Electronics, Power Electronics, Audio, Video Systems, Embedded Systems, Mechatronic Systems Microcontroller based projects should preferably use PIC/AVR/ATMEL controllers.
5.	A project report with following contents shall be prepared: Title Specifications Block diagram Circuit diagram Selection of components Simulation results PCB artwork Layout versus schematic verification report Testing procedures Enclosure design Test results Conclusion References

Mapping of CO and PO

	POs												**PSOs**	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
CO1	√	√		√					√			√		
CO2	√				√							√		
CO3	√	√	√			√			√		√	√	√	√

Assessment Pattern

Knowledge Level	**CT1**	**CT2**	**TA**	**ESE**
Remember			√	√
Understand			√	√
Apply			√	√
Analyze			√	√
Evaluate			√	√
Create			√	√
Total			10	50

Government College of Engineering Karad
Third Year B. Tech.
EX 506: Digital Communication Laboratory

Laboratory Scheme		**Examination Scheme**	
Practical	2 Hrs/week	**CA**	25
Total Credits	1	**ESE**	50

Course Objectives : The student should be able to

1. Demonstrate various Modulation techniques in Digital Communication.
2. Categorize various digital data representation techniques.
3. Demonstrate various coding techniques.

Course Contents

Experiment 1	To analyze ASK, FSK modulation systems and interpret the modulated and demodulated waveforms.
Experiment 2	To analyze a BPSK modulation system and interpret the modulated and demodulated waveforms.
Experiment 3	To analyze QPSK, QAM modulation system and interpret the modulated and demodulated waveforms.
Experiment 4	To generate the various encoding schemes for a given data stream.
Experiment 5	Analysis of Eye Diagram using oscilloscope
Experiment 6	Generation of PDF for Random Variables using MATLAB/SCILAB Software
Experiment 7	Understanding lossless data compression using Huffman coding.
Experiment 8	To understand error detection and correction using Hamming Code
Experiment 9	To understand error detection and correction using Cyclic Code
Experiment 10	Generation of PN- Sequence

List of Submission

1. Total number of Experiments: 10
2. Project Visit Report

Additional Information

Course Outcome(CO) : Upon successful completion of this course, the student will be able to

1. Apply digital modulation schemes for communication
2. Analyze different digital data representation techniques.
3. Apply different coding techniques on digital data

Mapping of CO and PO

	PO												PSO	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
CO1	√	√	√		√							√	√	√
CO2	√				√							√	√	√
CO3	√	√	√		√							√	√	

Assessment Pattern

Skill Level (as per CAS Sheet)	**Exp 1**	**Exp 2**	**Exp 3**	**Exp 4**	**Exp 5**	**Exp 6**	**Exp 7**	**Exp 8**	**Exp 9**	**Exp 10**	**Avg.**
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering Karad
Third Year B. Tech.
EX 507: Embedded Systems Laboratory

Laboratory Scheme		**Examination Scheme**	
Practical	2 Hrs/week	**CA**	50
Total Credits	1	**ESE**	50

Course Objectives : The student should be able to

1 Identify hardware configuration of LPC21XX.
2 Write program for Interfacing real world devices.
3 Analyze and interpret various communication protocols in Embedded Systems.

Course Contents

Experiment 1 To write embedded C program for interfacing Seven Segment display with LPC 21XX.
Experiment 2 To write embedded C program for interfacing Relay with LPC 21XX.
Experiment 3 To write embedded C program for interfacing ADC with LPC 21XX.
Experiment 4 To write embedded C program for interfacing UART with LPC 21XX.
Experiment 5 To write embedded C program for interfacing Keyboard with LPC 21XX.
Experiment 6 LED interfacing with LPC 21XX.
Experiment 7 I2C EEPROM interfacing with LPC 21XX.
Experiment 8 RTC interfacing with LPC 21XX.
Experiment 9 Stepper Motor interfacing with LPC 21XX.
Experiment 10 Zigbee interfacing with LPC 21XX.

List of Submission

1 Total number of Experiments:08

Additional Information

Course Outcome : Upon successful completion of this course, the student will be able to

1 Design and develop interrupt based Embedded Systems.
2 Apply the knowledge of Embedded Systems to build small Embedded applications.

Mapping of CO and PO

	PO												**PSO**	
	a	**b**	**c**	**d**	**e**	**f**	**G**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
CO1	√	√	√	√	√	√			√		√	√	√	√
CO2	√	√	√		√				√			√	√	√

Assessment Pattern

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering Karad
Third Year B. Tech.
EX508:Digital Signal Processing Laboratory

Laboratory Scheme		**Examination Scheme**	
Practical	2 Hrs./week	**CA**	25
Total Credits	1	**ESE**	50

Course Objectives : The student should be able to

1. Implement circular convolution of two signals to obtain linear convolution.
2. Implement the FFT algorithms using DIT and DIF.
3. Write a program to compute DFT of a given signal.
4. Implement filters for smoothing data.

Course Contents

Experiment 1	Write a program for Linear and Circular convolution.
Experiment 2	Write a program for DFT and IDFT as filter.
Experiment 3	Write a Program for Segmented Convolution (Overlap Add Method).
Experiment 4	Write a Program for Segmented Convolution (Overlap Save method).
Experiment 5	Write a program for Design of LPF, HPF FIR filter using Frequency Sampling method.
Experiment 6	Write a program for Design of LPF, HPF FIR filter using windowing method.
Experiment 7	Write a program for Design of Butterworth IIR filter using Impulse Invariance Technique.
Experiment 8	Write a program for Design of Butterworth IIR filter using Bilinear Transformation Technique.
Experiment 9	Write a program to compute DCT and Inverse DCT.
Experiment 10	Write a Program for two-level decomposition of 2D signal.
Experiment 11	Hardware based experiment (any two from above list).

List of Submission

1. Total number of Experiments: 10

Additional Information

Course Outcome(CO) : Upon successful completion of this course, the student will be able to

1. Compute linear, circular and segmented convolution.
2. Design FIR and IIR systems.
3. Implement FIR and IIR Systems.
4. Implement various DSP Systems on DSP Processor.

Mapping of CO and PO

	PO												PSO	
	a	**b**	**c**	**d**	**e**	**f**	**G**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
CO1	√	√		√									√	
CO2	√	√	√	√						√				√
CO3			√		√				√					√
CO4			√		√				√					√

Assessment Pattern

Skill Level (as per CAS Sheet)	**Exp 1**	**Exp 2**	**Exp 3**	**Exp 4**	**Exp 5**	**Exp 6**	**Exp 7**	**Exp 8**	**Exp 9**	**Exp 10**	**Avg.**
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering Karad
Third Year B. Tech.
EX509:Instrumentation and Control Laboratory

Laboratory Scheme		**Examination Scheme**	
Practical	2 Hrs/week	**CA**	50
Total Credits	1	**ESE**	-

Course Objectives : The student should be able to

1 Understand and analyse the transducer and sensor.
2 Analyze the transient characteristics of different order system.
3 Analyze stability of linear feedback control system using modern control techniques.
4 Understand design insights of controllers.

Course Contents

Experiment 1 Study and Calibration of Resistive temperature detector for temperature measurement.
Experiment 2 Study and Calibration for measurement of speed.
Experiment 3 Study of capacitive and inductive sensor and application.
Experiment 4 Stability Analysis of First, Second and higher order Systems using MATLAB.
Experiment 5 Plotting of root locus using MATLAB.
Experiment 6 Plotting of Bode and Nyquist plot using MATLAB.
Experiment 7 Determination of transfer functions of physical system using Simulink.
Experiment 8 Stability analysis and state space model for a given system using MATLAB.
Experiment 9 Study of Tuning of a PID controller using MATLAB/Simulink.
Experiment 10 Study and Calibration of LVDT transducer for displacement measurement.

List of Submission

1 Total number of Experiments: 10
2 Project Visit Report

Additional Information

Course Outcome(CO) : Upon successful completion of this course, the student will be able to:

1 Develop models (transfer functions, state space,) for a variety of dynamic physical systems.
2 Obtain frequency response indices. Be able to draw frequency response plots such as polar plot, Bode plot etc.
3 Analyze effect of pole, zero addition for the stability analysis of high order systems.
4 Select transducers/sensors for specific application.

Mapping of CO and PO

	PO												PSO	
	a	**b**	**c**	**d**	**e**	**f**	**G**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
CO1	√	√			√				√		√	√	√	
CO2	√	√	√	√					√		√	√	√	
CO3	√	√							√					
CO4	√	√	√						√		√	√		

Assessment Pattern

Skill Level (as per CAS Sheet)	**Exp 1**	**Exp 2**	**Exp 3**	**Exp 4**	**Exp 5**	**Exp 6**	**Exp 7**	**Exp 8**	**Exp 9**	**Exp 10**	**Avg**
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering Karad.
Third Year B. Tech
HS003 – General proficiency III

Teaching Scheme		**Examination Scheme**	
Lectures	02 Hrs./week	**CA**	50
Practical	02 Hrs./week		
Total Credits	03		

Course Objectives

1 To understand the different components of selection process i.e. written test, GD & PI.

2 To equip the students with the ability to clear NACTECH, AMCAT & ELITMUS.

3 To develop a thorough understanding of these components through strong conceptual understanding, logical approach with various short cuts & practical techniques for manage speed and accuracy to clear the written test & participation in GD & PI

Course Contents

Hours

Unit I **Soft skills** **10**

The module Corporate Recruitment Training has four different topics that are**:**

- JAM
- Basics of Group Discussion
- Effective Resume' Writing
- Basics of Interview Skills

Unit II **Basic concept 4** **8**

The module basic concept 4 has the following topic**:**

- Ratios & proportions
- Partnerships
- Problems on ages
- SI & CI
- Averages
- Clocks & Calendars

Unit III **Logical Reasoning** **8**

The module reasoning has the following topic**:**

- Venn diagrams
- Cubes
- Logical deductions
- Letter series
- Number series
- Odd man out

Unit IV **Basic concepts 5** **6**

The module basic concepts 5 has the following topic**:**

- Number system
- Mensurations
- Probability
- Permutations & combinations

Unit V **Reasoning** **10**

- Reasoning 3
- Reasoning 4
- Data interpretation
- Data sufficiency

Unit VI **Verbal Aptitude Skills** **10**

The module verbal aptitude has the following topics**:**

- Introduction to verbal aptitude & verbal pattern
- Synonyms & antonyms
- Spotting errors & Sentence correction
- Reading comprehension & sentence rearrangement

Note **Delivery Methodology to be followed fully depends on the Skill sets as detailed below.**

Language Skills

- A new methodology of acquiring language which integrates LSRW through emotional connect & experiences in one's life.
- The integrated approach coupled with lot of interaction, group work & effective facilitation leads to overall improvement of one's communication skills

Soft Skills

- Pre & post assessment for each topic
- Comprehensive pre & post assessment capsule wise.
- Explanation of the concept
- Self-assessment inventory
- Activities for experiential learning
- Case studies for better understanding of the concept
- PPTs and videos

Aptitude Skills

- Pre & post assessment
- Explaining the concept
- Multiple approaches to the given problem
- PPTs

Verbal Aptitude Skills

- Pre & post assessment for each topic
- Comprehensive pre & post assessment capsule wise.
- Explanation of the concept
- Work sheet for each topic

References:

1. Understanding organizational Behavior by Uday Parek
2. Training instruments on HRD & OD by Uday Parek & Dr.Surabhi purohit
3. Language Instinct by Steven Pinker
4. Freedom from Imperial shakels by Dr.K.N. Anandan
5. Quantitative Aptitude by R.S. Agarwal
6. Quicker Maths by Tyra & khundan
7. Quantitative Aptitude by Abhijeet Guh

Course Outcomes
After completing this course students will be able:

- To understand different components of campus recruitment drive.
- To effectively present oneself &ideas in JAM ,GD& interview
- To draft a resume effectively and practice the questions asked from resume'
- To learn & practice different components of verbal topics
- To learn different methods in vocabulary building & contextually use them.
- To learn various bridges in analogies
- To learn different techniques & to spot the errors pertaining to various grammatical rules & structures.
- To explaining concepts and sharing different logics for faster computations in different topics of Aptitude and Reasoning.

- The students will be able to identify and use formula as a strategy for solving problems.
- Faster computations
- Identifying most commonly made mistakes and thereby improving upon their accuracy.

Government College of Engineering Karad
Third Year B. Tech
OE651:Open Source Embedded Tools

Teaching Scheme		**Examination Scheme**	
Lectures	2Hrs/week	**CT1**	-
Practical	2Hrs/week	**CT2**	-
Total Credits	3	**TA/CA**	50
		ESE	50

Course Objectives : The student should be able to

1. Understand and learn recent open source platform for Microcontrollers in electronics.
2. Interface and write simple programs for any applications using open source IDE.
3. Understand programming in python.
4. Interface various sensors and devices to microcontroller.

Course Contents		**Hours**
Unit I	Introduction to Arduino Board, Basics Types, History and IDE, Arduino compatible shields with their libraries.	05
Unit II	Interfacing Arduino with LED, LDR and 7-Segment,LCD, Switches and their Programming.	05
Unit III	ADC, PWM and basic input output modules in Arduino.	05
Unit IV	Interfacing with LED, LDR,7-Segment,LCD and Switches. Python and 'C' Programming.	05
Unit V	ADC,PWM and basic input output modules in Raspberry Pi.	06
Unit VI	Introduction to IOT. Introduction to Raspberry Pi Board, Basics Types, History and IDE, compatible shields with their libraries.	02

Course Outcomes : Upon successful completion of this course, the student will be able to

1. Handle advanced microcontrollers, processors like Arduino and Raspberry pi in real world.
2. Interface various sensors and write program accordingly.
3. Design and write program in C and python for different applications.
4. Design and built any small scale system around microcontrollers.

Text Books:

1. Eben Upton,Gareth Halfacree, *"Raspberry Pi User Guide",* Wiley Publication, 3rdEdition, 2016.
2. Simon Monk, *"Programming Arduino Getting Started with sketches",*The McGrw Hill Companies,Student Edition, 2011.

Reference Books

1. O'Reilly Media, *"Arduino Cookbook",*Michael Margolis Publications, 2ndedition, 2012.
2. Massimo Banzi, *"Getting Started with Arduino",*Student edition, 2009.
3. Simon Monk,*"Programming the Raspberry Pi: Getting Started with Python",* 2nd Ed., 2015.

Useful Links

1. https://www.youtube.com/watch?v=95w4sx_zoB8
2. https://www.youtube.com/user/StudentCompanionSA

3 https://www.arduino.cc/en/Tutorial/HomePage
4 http://www.ladyada.net/learn/arduino/index.html
5 https://learn.adafruit.com/category/learn-arduino
6 http://www.jeremyblum.com/category/arduino-tutorials/
7 https://www.youtube.com/user/RaspberryPiBeginners/featured

List of Experiments

Experiment 1 Program for Toggling LED connected to Arduino.
Experiment 2 Program for Interfacing LDR to Arduino.
Experiment 3 Program to Interface LCD and Display message to Arduino.
Experiment 4 Program for interfacing Bluetooth module with Arduino.
Experiment 5 Program for Key Interface with Arduino.
Experiment 6 Connectivity of LM35 (Logan temperature sensor) with Arduino and write a program in which if temperature crosses its threshold value it should be reflected with LED.
Experiment 7 Connectivity and configuration of Raspberry circuit with basic peripherals.
Experiment 8 Connectivity with LED and Traffic signal Program with the help of LED to Raspberry circuit.
Experiment 9 Understanding different components of relay circuit and Connectivity of Toy motor and Relay Circuit with Raspberry circuit.
Experiment 10 Connectivity of IR sensor with Raspberry circuit.
Experiment 11 Understanding and Connectivity of other sensors (Camera, ZIGBEE, MQ2 Gas Sensor, Smoke Detector etc.) with Raspberry pi.
Experiment 12 Develop a Real time application like smart home, smart parking etc.

List of Submission

1 Total number of Experiments: 08

Mapping of CO and PO

	POs												PSOs	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**J**	**K**	**l**	**m**	**n**
CO1	√		√	√							√			
CO2	√		√	√							√	√	√	√
CO3	√		√	√							√	√	√	√
CO4	√	√	√	√							√	√	√	√

Assessment Pattern

Knowledge Level	**CT1**	**CT2**	**TA**	**ESE**
Remember			√	√
Understand			√	√
Apply			√	√
Analyze			√	√
Evaluate			√	√
Create			√	√
Total	NA	NA	50	50

Government College of Engineering Karad
Third Year B. Tech.
EX602: Antenna and Wave Propagation

Teaching Scheme		**Examination Scheme**	
Lectures	4 Hrs/week	**CT1**	15
Total Credits	4	**CT2**	15
		TA	10
		ESE	60
		Duration of ESE	2 Hrs 30 min

Course Objectives : The student should be able to

1. Understand the fundamentals of antenna systems.
2. Analyse various solution method for finding radiation pattern.
3. Introduce various antenna types and their application.
4. Analyse radio wave propagation.

Course Contents		**Hours**
Unit I	**Antennas:** Introduction, types of antennas, Radiation mechanism, Current distribution on a thin wire antenna.	3
Unit II	**Fundamental parameters of antennas:** Introduction, Radiation pattern, Radiation Power density, Radiation Intensity, Beam width, numerical technique, antenna efficiency, bandwidth, Polarisation, Input impedance, Antenna radiation efficiency, antenna vector effective length and equivalent areas, Maximum directivity, and maximum effective area, Friis transmission equation, antenna temperature, problems.	8
Unit III	**Integral equations, moment method and self and mutual impedances:** Introduction, Integral equation method, finite diameter wires, moment method solution, self-impedance, mutual impedance between linear elements, mutual coupling in arrays, problems.	5
Unit IV	**Antenna Geometry:** Small dipole, half-wavelength dipole, small circular loop, ferrite loop, biconical antenna, triangular sheet, bow -tie and wire simulation, cylindrical dipole, folded dipole, discone, travelling wave antenna, broad band antenna, log -periodic antenna, Hugen's principle, rectangular aperture, circular aperture, horn antenna and its types, plane reflector, corner reflector, parabolic reflector, spherical reflector, rectangular patch, circular patch, coupling .	8
Unit V	**Smart antenna:** Introduction, smart -antenna analogy, cellular radio systems evolution, signal propagation, smart antennas benefits, smart antenna drawbacks, antenna beam forming.	6

Unit VI **Antenna Measurements:** 6

Introduction, antenna ranges, radiation patterns, gain measurements, directivity measurements, radiation efficiency, impedance measurements, current measurements, Polarization measurement, scale model measurements.

Unit VII **Ionospheric propagation:** 8

The ionosphere, effective permittivity and conductivity of an ionized gas, reflection, and refraction of the waves by the ionosphere, regular and irregular variation of the ionosphere, attenuation factor, sky wave transmission calculation, effect of earth magnetic field m wave propagation in ionosphere m faradays rotation and measurement of total electron content, other ionosphere phenomena.

Course Outcome (CO) : Upon successful completion of this course, the student will be able to

1. Explain the radiation through antenna and identify different types of antenna.
2. Identify and measure the basic antenna parameter.
3. Design and analyse wire antennas.
4. Design and analyse the solution method for finding radiation pattern.
5. Identify the characteristics of radio wave propagation.

Text Books

1. C Balanis, "Antenna Theory: Analysis and Design", Wiley, India, 4th Edition 2016.
2. J. D. Krauss, "Antennas for all application", TMH, 3rd edition, 2002.

References

1. G. S. N. Raju, "Antennas and Wave Propagation", Pearson education, Third edition, 2009.
2. Vincent F. Fusco, "Foundations of Antenna Theory and Technique", Pearson Education, Second Edition, 2007.
3. K.D. Prasad, "Antenna & Wave Propagation", Satyprasakash Publications, 1st Edition, 1996.
4. Jordan and Balmain, "Electromagnetic wave and radiation systems", PHI Publication, second edition, 1995.

Useful Links

1. www.nptel.ac.in/courses/117107035
2. http://www.antenna-theory.com/
3. http://www.altairhyperworks.com/ResourceLibrary
4. www.qsl.net/**4nec2**
5. https://www.tutorialspoint.com/**antenna_theory**/index.htm

Mapping of CO and PO

	PO												PSO	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
CO1	√	√		√										
CO2	√													√
CO3	√	√	√	√	√						√		√	
CO4	√	√	√	√	√						√		√	
CO5	√	√		√						√				

Assessment Pattern

Knowledge Level	**CT1**	**CT2**	**TA**	**ESE**
Remember				√
Understand	√	√		√
Apply	√	√		√
Analyze	√			√
Evaluate		√		√
Create			√	√
Total	15	15	10	60

Government College of Engineering Karad
Third Year B. Tech
EX603:Power Electronics

Teaching Scheme		Examination Scheme	
Lectures	4 Hrs/week	**CT1**	15
Total Credits	4	**CT2**	15
		TA	10
		ESE	60
		Duration of ESE	2 Hrs 30 min

Course Objectives : The student should be able to

1. Identify Power Electronics Components like SCR, TRIAC, DIAC and their Operations in details.
2. Understand Applications of Power Electronic Devices in Controlled Converter and its Industrial Use.
3. Explain Applications of Power Electronic Devices in DC Choppers and their Industrial Use.
4. Understand Applications of Power Electronic Devices in Inverters there types and their Industrial Use.
5. Understand PLC architecture and Ladder Diagram Programming.

Course Contents **Hours**

Unit I **Power Electronics Semiconductor Devices:** 7

Introductions to Power Electronics devices such as SCR,DIAC,TRIAC, Power Diode, Power MOSFET, IGBT, Power Transistor with their Operation Principle and V-I Characteristics, Various SCR Triggering Circuits (R,RC,UJT),Turn On, Turn-Off(Commutations) methods of SCR.

Unit II **Controlled Converter** 8

Concept of Controlled Converter and their types. Single phase half wave, Single phase Full wave full converter (With both Bridge and Midpoint Types), Single Phase Full wave Half Converter (Semi-converter) under R and R-L load. Analytical Treatment of each Converter in detail. Single Phase Dual Converter, Effect of Source Inductance on the performance of Full converter, numerical based on above all types of converter.

Unit III **Choppers** 8

The chopper, Basic principle of DC chopper, Classification of DC choppers, Control strategies Basic DC-DC converter (switch regulator) topologies: Principle, operation and analysis for Step-down (Buck), Step-up (Boost), Step up/down (Buck-Boost), Continuous conduction and Discontinuous conduction operation Chopper configurations: Voltage Commutated, Current Commutated, Load Commutated Chopper Multi-phase chopper, Application of DC to DC converters.

Unit IV **Inverters** 6

Introduction to Inverters, Types/Classifications, Three phase Inverters, 120 degree, 180 degree mode operations, Voltage control Strategies and Harmonic Reduction.

Unit V **Programmable Logic Controllers** 8

Introduction to Programmable logic Controllers –
Overview, functions, and features PLC VS Personal computers, PLC Vs dedicated controllers, logic contact symbology, input and output addressing.

PLC Hardware – Power supply module, Programmable controllers, analogue input /output module, network interface module, serial communication modules, memory modules, introduction to remote input /outputs.

PLC programming – Configuration, Ladder logic (LD) , Functional Block diagram (FBD), Instruction list (IL), arithmetic functions , Logic Functions , Timers' and counters , Communication Instructions , functional blocks , derived function blocks , PID function Blocks.

Unit VI **Power Electronics for renewable energy conversion** 8

Solar: Block diagram of solar photo voltaic system, Boost, and buck -boost converters, selection of inverter, battery sizing, array sizing.

Wind: AC-DC-AC converters, uncontrolled rectifiers, case study of hybrid system.

Course Outcome (CO) : Upon successful completion of this course, the student will be able to

1 Identify various Power electronic devices and make their connections in the circuit as per the need.
2 Design Controlled Converter for different applications as well as can analyze their performance depending on different parameters.
3 Build any advanced system using PLC and can be able to simulate identify and debug the faults.
4 Build ladder diagram for industrial applications.

Text Books

1 P. S. Bhimra, "Power Electronics", Khanna Publishers, 3rd edition, 2006.
2 Khanchandani, "Power Electronics", Tata McGraw-Hill Education, Student Edition, 2008.

References

1 Alok Jain, "Power Electronics and its applications", Penram Internationals, 2nd Edition, 2006.
2 Ned Mohan, "Power Electronics", Wiley Publication, 3rd Edition, 1989.
3 Joseph Vithayathil, "Power Electronics Principles and applications", TMH, Int. Ed., 1995.
4 M. H. Rashid, "Power Electronics", Pearson Education India, 3rd Edition, 2013.

Useful Links

1 https://www.youtube.com/watch?v=1Auay7ja2oY
2 https://www.youtube.com/watch?v=M59eR0RnaOg

Mapping of CO and PO

	PO												PSO	
	a	**b**	**C**	**D**	**e**	**f**	**g**	**h**	**I**	**j**	**k**	**l**	**m**	**N**
CO1	√	√	√								√			
CO2	√	√	√								√			
CO3	√	√	√								√	√	√	√
CO4	√	√	√	√							√	√	√	√

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	√	√	√	√
Understand	√	√	√	√
Apply			√	
Analyze			√	
Evaluate	√	√	√	√
Create	√	√	√	√
Total	15	15	10	60

Government College of Engineering Karad
Third Year B. Tech
EX614 Random Signal Processing

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hrs/week	**CT1**	15
Total Credits	3	**CT2**	15
		TA	10
		ESE	60
		Duration of ESE	2 Hrs 30 min

Course Objectives : The student should be able to

1. Understand the elementary aspects of probability theory.
2. Provide necessary basic concepts in statistical signal analysis.
3. Understand concepts of random variables, probability density and cumulative distribution functions for discrete and continuous random variables.
4. Estimate various standard distributions.
5. Study random processes and its properties.

Course Contents **Hours**

Unit I **Probability:** 7

Introduction to probability, sets, fields, events, Axioms of probability, Joint, Conditional and Total Probabilities, Bayes' theorem and applications.

Unit II **Random Variables** 7

Definition of random variables, continuous and discrete random variables, cumulative distribution function (CDF) for discrete and continuous random variables; probability mass function (PMF); probability density functions (PDF) and properties, Jointly distributed random variables, conditional and joint density.

Unit III **Distribution Functions** 7

Binomial, Geometric, Poisson, Uniform, Exponential and Gaussian Bernoulli, Rayleigh distributions with examples. Central Limit theorem.

Unit IV **Expectation** 8

Fundamental Theorem of expectation, Moments, Joint moments, Moment Generating functions, Characteristic functions, Conditional Expectations, Correlation and Covariance.

Unit V **Random Process** 8

Definition, discrete and continuous time processes, Probabilistic structure of a Random process; mean, correlation and covariance functions, stationarity of random process, Ergodicity, Transmission of WSS random process through LTI system, Spectral analysis of random processes, Weiner and Poisson Random process.

Course Outcome (CO) : Upon successful completion of this course, the student will be able to

1 Apply theory of probability in identifying and solving relevant problems.
2 Define and specify random processes and determine whether a given process is stationary or wide sense stationary.
3 Develop applications of statistics in information systems.
4 Determine the response of a linear time invariant system to a random process.

Text Books

1 Papoulis and S. Unnikrishnan Pillai, “Probability, Random Variables and Stochastic Processes," Fourth Edition, McGraw Hill. 2002
2 H. Stark and J. Woods, ``Probability and Random Processes with Applications to Signal Processing,'' Third Edition, Pearson Education. 2002

References

1 K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International Student Edition.
2 V. K. Rohatgi and A. K. Md. E. Saleh, `An Introduction to Probability and Statistics', Wiley 2001 (Indian edition).
3 Hwei Hsu, “Probability Random Variable,s Random Process, Schaulm‟s Outlines, Tata McGraw Hill, 2004.
4 Geoffrey Grimmett, David Stirzaker , Probability and Random Processes .Oxford University Press,Third Edition, 2001
5 Gray, R. M. and Davisson L. D. , An Introduction to Statistical Signal Processing, Cambridge University Press, 2004
6 Miller, “Probability And Random Processes-With Applications to Signal Processing and Communication”, Elsevier, First edition 2007
7 Bertsekas, Dimitri, and John Tsitsiklis. Introduction to Probability. Athena Scientific, Second Edition, 2008.

Useful Links

1 https://ee.stanford.edu/~gray/sp.html
2 https://www.youtube.com/watch?v=h-CdTxDShho&list=PLC6210462711083C4
3 https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-041sc-probabilistic-systems-analysis-and-applied-probability-fall-2013/
4 http://www.faculty.jacobs-university.de/poswald/teaching/ESM2B/handouts/ProbabilityRandomProcessesBook.pdf

Mapping of CO and PO

	PO												PSO	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
CO1	√	√	√		√				√			√	√	
CO2	√	√		√									√	
CO3	√	√	√						√		√	√		
CO4	√	√		√										

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember			√	√
Understand		√	√	√
Apply	√	√	√	√
Analyze	√	√	√	√
Evaluate	√	√	√	√
Create				
Total	15	15	10	60

Government College of Engineering Karad
Third Year B. Tech
EX624:Computer Organization

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hrs/week	**CT1**	15
Total Credits	3	**CT2**	15
		TA	10
		ESE	60
		Duration of ESE	2 Hrs 30 min

Course Objectives : The student should be able to

1. Understand the structure, functional units and component characteristics of computer systems.
2. Identify the elements of modern instructions sets and explain their impact on processor design.
3. Recognize different elements of Parallel Computer Architecture.

Course Contents		**Hours**
Unit I	**Computer Evolution & Arithmetic** A Brief History of computers, Computer Components, Interconnection Structures, Bus Interconnection, Scalar Data Types, Fixed and Floating point numbers, High speed adders, twos complement multiplier, Booths multiplication algorithm, Non restoring division algorithm for unsigned integers.	6
Unit II	**The Central Processing Unit** Machine Instruction characteristics, types of operands, types of operations, Addressing, Instruction formats, Processor organization, Register Organization, Instruction cycles, Instruction pipelining, ALU – Combinational ALUs and Sequential ALUs.	6
Unit III	**The Control Unit** Control Unit Operations, Hardwired Control: Design methods – State table and classical method, Design Examples - Multiplier CU. Micro-programmed Control: Basic concepts, Microinstructions and micro- program sequencing.	6
Unit IV	**Memory Organization** Characteristics of memory systems, Internal and External Memory, Caches: Cache organization, Cache operation and Address Mapping, Virtual Memory: Main Memory allocation, Segmentation, Paging, Address Translation.	6
Unit V	**I/O Organization** External Devices, I/O modules, Programmed I/O, Interrupt Driven I/O, Direct Memory Access, I/O Channels and Processors. Introduction to assembly and maintenance.	6

Unit VI **Parallel Organizations** 8

Parallel Computer Structures: Pipeline Computers, Array computers, Multiprocessor systems, performance of parallel computers, Dataflow and New concepts; Architectural Classification Schemes: Multiplicity of Instruction Data streams, Serial vs Parallel processing, Parallelism vs Pipelining.

Course Outcome (CO) : Upon successful completion of this course, the student will be able to

1 Demonstrate computer organisation and architecture concepts related to design of modern processors, memories and I/Os.
2 Design an interconnection of networks and multiprocessors.

Text Books

1 W. Stallings, "Computer Organization and Architecture: Designing for performance", Prentice Hall of India, 6 th Edition, 2003.
2 C. Hamacher, V. Zvonko, S. Zaky, "Computer Organization", McGraw Hill, 6th Edition, 2002

References

1 J. Hays, "Computer Architecture and Organization", McGraw-Hill, 2nd Edition, 1988.
2 W. Stallings William, "Computer Organization and Architecture: principles of structure and function", Maxwell Macmillan Editions, 2 nd Edition, 1990. (Chapter: 2,3,4,5,7,8,9,10,11,12,13,14)
3 A. Tanenbaum, "Structured Computer Organization", Prentice Hall of India, 4 th Edition, 1991. (Chapter: 1,4, 5,6,8)
4 G. George, "Computer Organization: Hardware and Software", Prentice Hall of India, 2 nd Edition, 1986 (Chapter: 3, 4, 5).
5 D. Paterson, J. Hennesy, "Computer Organization and Design: The Hardware Software Interface", Morgan Kauffman, 2 nd Edition, 2000.

Useful Links

1 http://nptel.ac.in/courses/106106092/ (Prof. S. Raman, IIT Bombay)
2 http://nptel.ac.in/courses/106106134/ (Prof. Madhu Matyam, IIT Madras)
3 http://nptel.ac.in/courses/106102062/ (Prof. Anshul Kumar, IIT Delhi)
4 http://williamstallings.com/COA5e.html
5 https://www.youtube.com/watch?v=TH9nd-KdVHs&list=PLm6ShqSrKDxNdGQXKv48ovhvYZpc6m5tN (Prof. P. K. Biswas, IIT Kharagpur)
6 https://www.youtube.com/watch?v=4TzMyXmzL8M&list=PL13FD5F00C21BBC0B (Prof. Anshul Kumar, IIT Delhi)

Mapping of CO and PO

	PO												PSO	
	a	**b**	**C**	**d**	**e**	**f**	**g**	**h**	**i**	**J**	**k**	**l**	**m**	**n**
CO1	√	√	√		√	√	√		√	√	√	√		√
CO2	√	√		√		√						√	√	

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember		√	√	√
Understand	√	√	√	√
Apply	√	√	√	√
Analyze	√	√	√	√
Evaluate				
Create				
Total	15	15	10	60

Government College of Engineering Karad
Third Year B. Tech
EX634: Image Processing

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hrs/week	**CT1**	15
Total Credits	3	**CT2**	15
		TA	10
		ESE	60
		Duration of ESE	2 Hrs 30 min

Course Objectives : The student should be able to

1. Understand inter-pixel relationship with in the image.
2. Execute basic image processing operations.
3. Understand digital image processing fundamentals like enhancement, encoding, feature extraction, segmentation and restoration.
4. Identify recent trends in digital image processing and implement its applications.

Course Contents **Hours**

Unit I **Introduction to image processing:** 05

Applications and fields of image processing, Fundamental steps in Digital image processing, Elements of visual perception, Image sensing and acquisition, Basic Concepts in Sampling and Quantization, representing digital images.

Unit II **Image Enhancement in the Spatial Domain:** 08

Some basic gray level transformations, Histogram Processing, Spatial filtering, Smoothing Spatial filters, Sharpening Spatial filters: use of first and second derivatives for enhancement; LOG.

Image Enhancement in the Frequency Domain: Gaussian filters, Homomorphic filtering.

Digital Image Transforms: The KL transform, Walsh / Hadamard Transform, Haar Transform.

Unit III **Morphological Image Processing:** 07

Dilation & Erosion, Opening and Closing operation, Hit- or –miss transformation. Basic morphological algorithms: Boundary extraction, region filling, thinning and thickening, skeletons.

Unit IV **Image Segmentation:** 08

Some Basic Relationships between pixels, point, line and edge detection, Gradient operators, Canny edge detection, pyramid edge detection. Edge linking and boundary detection. Hough transform, Chain codes, boundary segments, skeletons, Boundary descriptors, Fourier descriptors, Thresholding, global thresholding, adaptive thresholding, use of boundary characteristics for histogram improvement and local thresholding, Region based segmentation, Region growing, region splitting and merging. Introduction to classifier.

Unit V **Image Compression**: 07

Data redundancies Elements of information, variable-length coding uniform and non-uniform Quantizers, predictive coding, Transform coding, Image compression standards; Wavelets and Multi- resolution processing: - Image pyramids, sub-band coding and JPEG compression.

Unit VI **Case Study:** 05

Finger print analysis, Digital watermarking, Optical character recognition etc.

Course Outcome (CO):

Upon successful completion of this course, the student will be able to:

1. Apply knowledge of various transforms (Walsh, Hadamard, etc.) and probability theory in image processing.
2. Apply different types of Image Processing Algorithm like enhancement, restoration, segmentation, feature extraction and encoding on image and evaluate the results.
3. Analyze, apply and critically evaluate various image processing algorithms appropriate for practical applications.

Text Books

1. Gonzalez & Woods, "Digital Image Processing", Pearson Education, 3rd Edition, 2009.
2. Madhuri Joshi, "Digital Image Processing: An Approach", PHI Learning Pvt. Ltd, 1st Ed., 2006.

References

1. Milan Sonka et al, "Image Processing, Analysis and Machine Vision", Thomson Learning, 2nd Edition, 2001.
2. B. Chanda & D. Dutta Majumder, "Digital Image Processing and Analysis", PHI Learning Private Limited, 2nd Edition, 2004.
3. Rafael C. Gonzalez, Richard E. Woods, and Steven L. Eddins, "Digital Image Processing Using MATLAB", Tata McGraw Hill Publication, 3rd Edition, 2009.

Useful Links

1. http://nptel.ac.in/courses/117105079/
2. http://nptel.ac.in/courses/106105032/
3. http://freevideolectures.com/Course/2316/Digital-Image-Processing-IIT-Kharagpur
4. http://www.nptelvideos.in/2012/12/digital-image-processing.html

Mapping of CO and PO

	PO												PSO	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
CO1	√	√	√		√								√	√
CO2	√	√	√	√	√								√	√
CO3	√	√	√	√	√	√		√	√			√	√	√

Government College of Engineering Karad

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	√		√	√
Understand			√	√
Apply	√	√	√	√
Analyze	√	√	√	√
Evaluate		√	√	√
Create				√
Total	15	15	10	60

Third Year B. Tech
EX644 : Information Theory and Coding

Teaching Scheme		Examination Scheme	
Lectures	3 Hrs/week	**CT1**	15
Tutorial	--	**CT2**	15
Total Credits	3	**TA**	10
		ESE	60
		Duration of ESE	2 Hrs 30 min

Course Objectives : The student should be able to

1. Understand various source coding techniques for data compression.
2. Understand various channel coding techniques and their capability.
3. Analyze performance of communication system with coding and modulation.

Course Contents **Hours**

Unit I **Information Theory and Source Coding:** 8

Introduction to information theory, Entropy and its properties, Source coding theorem, Huffman coding, Shannon-Fano coding, The Lempel Ziv algorithm, Run Length Encoding, Discrete memory less channel, Mutual information, Detail overview of JPEG.

Unit II **Information Capacity and Channel Coding** 8

Channel coding: Introduction to channel coding, Channel models, Channel capacity, Differential entropy and mutual Information for continuous ensembles, Linear block codes, Error correction and detection capability, Usefulness of the standard array, Hamming code, Golay Code, Interleaved code.

Unit III **Cyclic Codes** 8

Galois field, Primitive element & Primitive polynomial, Minimal polynomial and generator polynomial, Description of Cyclic Codes, Generator matrix for systematic cyclic code, Encoding for cyclic code, Syndrome decoding of cyclic codes, Circuit implementation of cyclic code.

Unit IV **Advance channel coding** 8

Binary BCH code, Generator polynomial for BCH code, Decoding of BCH code, RS codes, generator polynomial for RS code, Decoding of RS codes, Cyclic Hamming code and Golay code, CRC code,. Case Study: RS Coding in CD recording.

Unit V **Convolutional Codes** 8

Introduction of convolution code, State diagram, Polynomial description of convolution code, Generator matrix of convolution code, Tree diagram, Trellis diagram, Sequential decoding and Viterbi decoding, Known good convolution code, Introduction to Turbo codes.

Course Outcome (CO) : Upon successful completion of this course, the student will be able to

1 Design a data compression scheme using suitable source coding technique.

2 Design a channel coding scheme for a communication system.

3 Evaluate performance of a communication system.

Text Books

1 Ranjan Bose, "Information Theory coding and Cryptography", McGraw-Hill Publication, 2 nd Edition, 2002.

2 J C Moreira, P G Farrell, "Essentials of Error-Control Coding", Wiley, Student Edition, 2006.

References

1 Simon Haykin, "Communication Systems", John Wiley & Sons, 4th Edition, 2013.

2 Todd Moon, "Error Correction Coding: Mathematical Methods and Algorithms", Wiley Publication, 2005.

3 Khalid Sayood, "Introduction to Data compression", Morgan Kaufmann Publishers, 2012.

Useful Links

1 http://nptel.ac.in/courses/117101053/

2 http://nptel.iitg.ernet.in/Elec_Comm_Engg/IISc%20Bangalore/Information%20Theory%20and%20Coding.htm

Mapping of CO and PO

	PO												PSO	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
CO1	√	√	√		√				√		√	√	√	
CO2	√	√	√		√				√		√	√	√	
CO3	√	√		√	√				√					

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	√		√	√
Understand	√	√	√	√
Apply		√	√	√
Analyze		√	√	√
Evaluate	√			
Create				
Total	**15**	**15**	**10**	**60**

Government College of Engineering Karad
Third Year B. Tech
EX605 : Industrial and Project Management

Teaching Scheme		**Examination Scheme**	
Lectures	4 Hrs/week	**CT1**	15
Tutorial	--	**CT2**	15
Total Credits	4	**TA**	10
		ESE	60
		Duration of ESE	2 Hrs 30 min

Course Objectives : The student should be able to

1. Understand fundamentals of Industrial and Project Management.
2. Understand the need of marketing and advertisement in profit making of the company.
3. Understand the fundamentals of Operation Research.
4. Implement the different techniques for project management.

Course Contents **Hours**

Unit I **Introduction to Management** 8

Definition, Meaning and Concepts of Management, Functions of Management: Planning, Organizing, Directing Coordinating and Controlling. Motivation Theory, Leadership. ISO standards.

Unit II **Marketing and Advertising concepts** 8

Marketing and selling concepts, Advertising- concept, need, types, advantages and limitations. Material Management– concept, function, Purchase management-concept, objectives, functions, importance, policies and procedure. Inventory Control- Inventory costs, EOQ analysis, ABC analysis. SWOT analysis.

Unit III **Costing** 8

Elements of cost, cost estimation procedure, Entrepreneurship-importance, Qualities, function of entrepreneur, small scale industries procedure of starting SSI unit, Difference Schemes for SSI. Forms of Business Organization -Single, partnership, Joint stock, co-operative and state and central Govt., Social responsibilities and business ethics-introduction.

Unit IV **Introduction to Operation Research** 8

Operations Research Definition, methodology, Scope and limitations. Linear programming Concept, Formulation of LPP, Graphical method, Simplex Method.

Unit V **The Transportation and Assignment Problems** 7

Assignment Problems- Introduction, Balanced, Unbalanced, Prohibitive type of assignments, Hungarian method

Transportation Problems- finding basic feasible solution by Northwest corner method, Least cost method and Vogel's Approximation method.

Unit VI **Project Management with PERT/CPM** 6

Project Management, Programmed Evaluation and review technique (PERT), critical path method (CPM), Network Analysis, Identifying critical path, Probability of completing the project within the given time. Introduction to Six sigma.

Course Outcome (CO) : Upon successful completion of this course, the student will be able to:

1 Apply the knowledge of management for the development of an organization.
2 Apply the concepts of marketing and advertising for the selling of products.
3 Analyze various industrial problems with the use of Operation Research concepts.
4 Handle the projects efficiently with the use of project management techniques.

Text Books

1 O.P. Khanna, "Indusrial Engineering and Management", Dhanpat Rai Publication,17th Edition, 2010.
2 Panneerselvam, "Operation Research", PHI Learning Publication, 2nd Edition,2009.

References

1 N. V. S. Raju, "Industrial Engineering and Management", Cengage Learning India, 1st Edition, 2013.
2 S. D. Sharma, "Operations Research", KedarNath Ram Nath publication, 15th Edition, 2005.
3 Taha H.A., "Operations Research - An Introduction", Prentice Hall Pub, 7th Edition, 2002.
4 Harold Koontz, Heinz Weihrich, "Essentials of Management", Tata McGraw Hill Publication, 8th Edition, 2009.

Useful Links

1 http://www.nptelvideos.in/2012/11/management-science.html
2 http://nptel.ac.in/courses/112106134/1

Mapping of CO and PO

	PO												PSO	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
CO1		√	√	√	√	√	√	√	√	√	√	√		
CO2						√	√	√	√	√	√	√		
CO3	√	√	√	√	√				√	√	√	√		
CO4		√	√	√		√	√	√	√	√	√	√		

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	√	√	√	√
Understand	√	√	√	√
Apply	√	√	√	√
Analyze	√	√	√	√
Evaluate	√	√	√	√
Create				
Total	15	15	10	60

Government College of Engineering Karad
Third Year B. Tech
EX606: Antenna and Wave Propagation Laboratory

Laboratory Scheme		**Examination Scheme**	
Practical	2 Hrs/week	**CA**	25
Total Credits	1	**ESE**	50

Course Objectives : The student should be able to

1 Compareradiation pattern of various antenna.
2 Understandcharacteristics of transmission line.
3 Learnvarious simulation software's for antenna design.

Course Contents

Experiment 1 Calculation of beam width, front to back ratio and gain of simple dipole antenna.
Experiment 2 Calculation of beam width, front to back ratio and gain of log -periodic antenna.
Experiment 3 Calculation of beam width, front to back ratio and gain of yagi -uda antenna.
Experiment 4 Calculation of beam width, front to back ratio and gain of micro strip patch antenna.
Experiment 5 To plot radiation pattern of 3ƛ dipole antenna and compare with ƛ/2 dipole antenna.
Experiment 6 Design of 75Mhz dipole antenna using Cad-Feko.
Experiment 7 Design a five element Yagi -antenna using Cad-Feko.
Experiment 8 To write a program to plot radiation pattern of travelling wave antenna.
Experiment 9 To write a program to plot 3D pattern of rectangular apertures as a function of the independent variables Vx, Vy for aperture dimensions a =8 ƛ and b= 4 ƛ.
Experiment 10 To plot standing wave pattern and measure standing wave ratio for open, short and match termination.

List of Submission

1 Total number of Experiments: 10
2 Project Visit Report.

Additional Information

Course Outcome(CO) : Upon successful completion of this course, the student will be able to

1 Identify and measure the basic antenna parameters.
2 Design and analyse wire antenna.
3 Design and analyse micro strip antenna.

Mapping of CO and PO

	PO												**PSO**	
	a	**b**	**c**	**d**	**E**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
CO1	√	√												√
CO2	√	√	√	√	√						√		√	
CO3	√	√	√	√	√						√		√	

Assessment Pattern

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg.
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering Karad
Third Year B. Tech
EX607: Power Electronics Laboratory

Laboratory Scheme		**Examination Scheme**	
Practical	2 Hrs/week	**CA**	25
Total Credits	1	**ESE**	-

Course Objectives : The student should be able to

1. Identify Different Power Electronics Components Identify their Terminals.
2. Explain and observe V-I characteristics of Different Power Electronics semiconductor devices.
3. Test and implement different Triggering circuits for SCR.
4. Analyze and interpret different Controlled Converters with various types of loads.
5. Identify PLC connections and necessary Programming.

Course Contents

Experiment 1	Study and Perform V-I Characteristics of SCR.
Experiment 2	Study and Perform V-I Characteristics of MOSFET and IGBT.
Experiment 3	Study and Perform V-I Characteristics of TRIAC and DIAC.
Experiment 4	Study and Perform Various Firing Circuits.
Experiment 5	Study and Perform Single Phase Half wave Controlled Converter.
Experiment 6	Study and Perform Single Phase Full wave Full Controlled Converter.
Experiment 7	Study and Perform Single Phase Full wave Half Controlled Converter.
Experiment 8	Study and Perform Inverter circuits.
Experiment 9	Build Not , AND and OR logic using ladder diagram with the help of PLC.
Experiment 10	Build NAND and NOR logic using ladder diagram with the help of PLC.
Experiment 11	Test and identify different types of timer.
Experiment 12	Test and identify different types of counter.
Experiment 13	Develop a ladder programming for a given statement – turn on the bulb 1 after 5sec of switch off. Turn the bulb2 off after 5sec of bulb1 on and test.
Experiment 14	Develop a ladder to switch on motor for given condition.

List of Submission

1. Total number of Experiments: 10

Additional Information

Course Outcome(CO) : Upon successful completion of this course, the student will be able to

1. Identify various Power electronic devices and make their connections in the circuit as per the need.
2. Design Controlled Converter for different applications as well as can analyze their performance depending on different parameters.
3. Build any advanced system using PLC and can be able to simulate identify and debug the faults.
4. Build ladder logic for different programs.

Mapping of CO and PO

	PO												PSO	
	a	**b**	**c**	**d**	**E**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
CO1	√	√	√								√	√	√	√
CO2	√		√								√	√	√	√
CO3	√		√								√	√	√	
CO4	√		√								√		√	√

Assessment Pattern

Skill Level (as per CAS Sheet)	**Exp 1**	**Exp 2**	**Exp 3**	**Exp 4**	**Exp 5**	**Exp 6**	**Exp 7**	**Exp 8**	**Exp 9**	**Exp 10**	**Avg.**
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering Karad
Third Year B. Tech
EX618: Random Signal Processing Laboratory

Laboratory Scheme		**Examination Scheme**	
Practical	2 Hrs/week	**CA**	25
Total Credits	1	**ESE**	50

Course Objectives : The student should be able to

1. Understand the elementary aspects of probability theory.
2. Understand the Computation of Expectations and Moments.
3. Estimate the distribution functions for any random process.
4. Validate Central Limit Theorem through experiments.

Course Contents

Experiment 1 Write a MATLAB code to produce a randomly generated number thatis equally likely to produce any number from the set {0, 1, 2, . . . 9}.

Experiment 2 Write a MATLAB code to simulate the tossing of two dice.

Experiment 3 Write a MATLAB code to produce a randomly generated number thatfollows the Bernoulli distribution for an arbitrary parameter.

Experiment 4 Write the MATLAB code to simulate a random variable, Z, for any PMF P(Z) .

Experiment 5 Use the MATLAB rand function to create a random variable X uniformly distributed over (0, 1). Then create a new random variable according to $Y = -\ln(X)$. Repeat this procedure many times to create a large number of realizations of Y. Using these samples, estimate and plot the probability density function of Y. Find an analytical model that fits estimated PDF.

Experiment 6 Write a MATLAB program to calculate the probability $Pr(x1 \leq X \leq x2)$if X is a Gaussian random variable for an arbitrary x1 and x2.Note: specify the mean and variance of the Gaussian random variable.

Experiment 7 Using MATLAB, create a histogram for the probability densities forany random variable Z.

Experiment 8 Use MATLAB to generate a large number of samples from a Gaussian Distribution with mean $\mu=20$ and variance $\sigma=4$.

List of Submission

1. Total number of Experiments: 08

Additional Information

Course Outcome(CO) : Upon successful completion of this course, the student will be able to

1. Apply theory of probability in identifying and solving relevant problems.
2. Develop applications of statistics in information systems.
3. Determine the response of a linear time invariant system to such a random process.

Mapping of CO and PO

	PO												PSO	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
CO1	√	√	√		√				√			√	√	
CO2	√	√		√									√	
CO3	√	√		√										

Assessment Pattern

Skill Level (as per CAS Sheet)	**Exp 1**	**Exp 2**	**Exp 3**	**Exp 4**	**Exp 5**	**Exp 6**	**Exp 7**	**Exp 8**	**Exp 9**	**Exp 10**	**Avg.**
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering Karad
Third Year B. Tech
EX 628:Computer Organization Laboratory

Laboratory Scheme		**Examination Scheme**	
Practical	2 Hrs/week	**CA**	25
Total Credits	1	**ESE**	50

Course Objectives : The student should be able to

1 Functioning of Digital logic circuits.
2 Understand machine language instructions and different instruction types.
3 Understanding I/O functions and working of different computer components.

Course Contents

Experiment 1 Study of ALU design using VHDL design.
Experiment 2 To design and simulate eight bit tri-state BUFFER in VHDL design.
Experiment 3 Design of State machines using VHDL.
Experiment 4 Advanced Data Transfer (offset, LEA), Basic instructions (arithmetic).
Experiment 5 Logical operations, Shift and Rotate operators.
Experiment 6 Working with both read-only and random-access memory.
Experiment 7 Standard I/O Functions.
Experiment 8 Special Registers, Flags, Operating with carry command (ADC) and command-flag interactions.

List of Submission

1 Total number of Experiments: 08

Additional Information

Course Outcome(CO):

Upon successful completion of this course, the student will be able to:

1 Perform assembly language programming.
2 Describe various data representations and explain how arithmetic and logical operations are performed by computers.
3 Design a basic computer system using the major components.

Mapping of CO and PO

	PO												**PSO**	
	a	**b**	**C**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
CO1	√	√			√				√		√	√	√	√
CO2	√	√		√	√				√		√	√	√	
CO3	√	√	√	√	√		√		√	√	√	√		√

Assessment Pattern

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg.
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering Karad
Third Year B. Tech
EX 638: Image Processing Laboratory

Laboratory Scheme		**Examination Scheme**	
Practical	2 Hrs/week	**CA**	25
Total Credits	1	**ESE**	50

Course Objectives : The student should be able to

1 Understand operations on Image.
2 Study Image Processing Applications.

Course Contents

Experiment 1	To perform simple gray level transformation on image.
Experiment 2	To perform Histogram equalization.
Experiment 3	To perform image smoothening operation.
Experiment 4	To perform Morphological operations on image.
Experiment 5	To perform Edge Detection of image.
Experiment 6	To perform image Segmentation.
Experiment 7	To perform quantization and compression of an image.
Experiment 8	To perform pseudocolor image processing.
Experiment 9	To perform RGB to Grayscale Image Processing using DIPLAB-1.0.
Experiment 10	To perform Negation of Image using DIPLAB-1.0.
Experiment 11	To perform RGB toYCbCr Colour Spaceusing DIPLAB-1.0.
Experiment 12	To perform Thresholding using DIPLAB-1.0.

List of Submission

1 Total number of Experiments: 10

Additional Information

Course Outcome : Upon successful completion of this course, the student will be able to

1 Implement the principles of Image Processing.
2 Develop "C/C++/MATLAB" codes for Image Processing Applications.

Mapping of CO and PO

	PO												**PSO**	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**N**
CO1	√	√										√	√	√
CO2	√	√	√	√	√				√		√	√	√	√

Assessment Pattern

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg.
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering Karad

Third Year B. Tech

EX648 : Information Theory and Coding Laboratory

Laboratory Scheme			**Examination Scheme**	
Practical	2 Hrs/week		**CA**	25
Total Credits	1		**ESE**	50

Course Objectives : The student should be able to

1	Understand various source and channel coding techniques in software and/or hardware.
2	Understand various source and channel encoding and decoding techniques.

Course Contents

Experiment 1	Entropy computation (Joint entropy, conditional entropy, self-information and mutual information).
Experiment 2	Huffman and Shanon-fanon source coding techniques to compress text files.
Experiment 3	LZW coding technique to compress text files.
Experiment 4	Linear Block codes: Encoding and Decoding.
Experiment 5	Cyclic Codes: Encoding and Decoding (Hardware using dividing circuits).
Experiment 6	Convolution coding scheme: Generation of Trellis Codes.
Experiment 7	Convolution decoding scheme: Viterbi decoding technique.
Experiment 8	Study of Reed and Solomon Codes.

List of Submission

1	Total number of Experiments: 08

Additional Information

Course Outcome(CO) : Upon successful completion of this course, the student will be able to

1	Deploy various source and channel coding techniques in software and hardware.
2	Apply mathematical knowledge to Estimate and improve the time and space complexity of the software implementation of coding techniques.

Mapping of CO and PO

	PO												**PSO**	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**N**
CO1	√	√			√				√					
CO2	√	√	√		√				√			√	√	√

Assessment Pattern

Skill Level (as per CAS Sheet)	**Exp 1**	**Exp 2**	**Exp 3**	**Exp 4**	**Exp 5**	**Exp 6**	**Exp 7**	**Exp 8**	**Exp 9**	**Exp 10**	**Avg**
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering Karad
Third Year B. Tech.
EX609: Minor Project

Teaching Scheme		**Examination Scheme**	
Practical	2Hrs/week	**CA**	50
Total Credits	2	**ESE**	50

Course Objectives:

The student should be able to:

1. Undertake & execute a Minor Project through a group of students.
2. Understand the "Product Development Cycle" through Project.
3. Learn budget planning for the project.
4. Inculcate electronic hardware implementation skills by -
   a. Learning PCB artwork design using an appropriate EDA tool.
   b. Imbibing good soldering and effective trouble-shooting practices.
   c. Following correct grounding and shielding practices.

The main aim of this course is to demonstrate the important attributes like critical thinking, creativity, collaborative efforts and communication skills in students. The aim is also to make students aware with the process involved in making product from idea. Not more than two students may carry out the minor project together. One supervisor from the department shall be assigned three project batches of the minor project.

The steps involved for completion of minor project includes, but not limited to:

1. Conceptualization of innovative idea through literature and market survey; sight visits; interaction with community or industry, socio-economic survey etc.
2. Design of product, processes, methods and systems using multidisciplinary knowledge
3. Fabrication of product, development of software, measurement methods etc.
4. Deployment, implementation and demonstration of project.
5. Presentation of project

(For purchase of consumables required for completion of project, every project batch shall receive funding from institute with maximum limit decided by BOM)

Guidelines for Project Selection:

Project work shall be based on any of the following:

1. **Design of any equipment /test setup/product (based on facilities available in college.)**
2. **Hardware/numerical or theoretical analysis /review of survey study/research and development work**

   The subject content of the minor project shall be from emerging/thrust areas, topic of current relevance. The completion of work, the submission of the report and assessment should be done at the end of semester.

Project Report Format:

Project report should be of 15 to 20 pages (typed on A4 size sheets). For standardization of the project reports the following format should be strictly followed.

1. **Page Size:** Trimmed A4
2. **Top Margin:** 1.00 Inch

3. Bottom Margin: 1.32 Inches
4. Left Margin: 1.5 Inches
5. Right Margin: 1.0 Inch
6. Para Text: Times New Roman 12 Point Font
7. Line Spacing: 1.5 Lines
8. Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman
9. Headings: Times New Roman, 14 Point Bold Face
10. Certificate: All students should attach standard format of Certificate as described by the department. Certificate should be awarded to batch and not to individual student. Certificate should have signatures of Guide, Head of Department and Principal/ Director.
11. Index of Report:

a. Title Sheet
b. Certificate
c. Acknowledgement
d. Table of Contents
e. List of Figures
f. List of Tables

12. References: References should have the following format
For Books: "Title of Book", Authors, Publisher, Edition
For Papers: "Title of Paper", Authors, Journal/Conference Details, Year

List of Submission

1 Working model of the project
2 Project Report
3 Presentation and demonstration of project in exhibition

Course Outcome : Upon successful completion of this course, the student will be able to

1 Ability to understand community needs
2 Ability to covert idea in to product
3 Ability to work in group
4 Ability to communicate effectively with customers
5 Implement electronic hardware by learning PCB artwork design, soldering techniques, trouble shooting etc.

Mapping of CO and PO

	PO												**PSO**	
	a	**b**	**c**	**D**	**e**	**f**	**g**	**h**	**I**	**j**	**k**	**l**	**m**	**n**
CO1	√	√		√					√			√		
CO2	√				√							√		
CO3	√	√	√			√			√		√	√	√	√
CO4	√	√	√		√	√			√		√	√	√	√
CO5	√	√	√		√	√			√		√	√	√	√

Assessment Pattern

The continuous assessment shall be done by the supervisor based on attributes like critical thinking, creativity, collaborative efforts and communication skills in students. The end semester assessment shall be done by external referee one week before the term end. The department shall arrange exhibition (all department will arrange the exhibition on same day) of the minor projects done by students and the referee will judge the project work in accordance with the outcomes of the course by interacting with students and marks will be awarded to individual student. This exhibition will remain open for all students, parents, and other citizens visiting the exhibition.

Government College of Engineering Karad
Third Year B. Tech
EX610: Seminar

Laboratory Scheme		Examination Scheme	
Practical	2 Hrs/week	**CA**	25
Total Credits	2	**ESE**	-

Course Objectives : The student should be able to

1 Understand different software tools utilised for preparing presentation and report writing.
2 Identify research areas for technological advancement.
3 Understand recent trends in industries.

Guidelines:

1) INTERACTION WITH YOUR GUIDE

It is recommended that you meet your guide regularly during the course of the seminar/project, though ultimately the form of this interaction depends on both of you. You should maintain a record notebook/file where you can include a record of your discussions with your guide, literature survey details, derivations etc. Such a system will allow easy and quick access to the details and chronology of your work.

You should submit report drafts and slides as and when requested by your guide.

The final responsibility for producing an error-free report lies with you, and not your guide.

2) SUBMISSION

The bound copies of your report and slides should be submitted within the given deadline to the designated person. Late submission may not be acceptable; If allowed, it will necessarily invite a penalty which may be reflected in your grade.

Make sure that the acceptance certificate in your report is signed by your guide before you make the final submission of the report.

3) REPORT FORMAT

3.1. Top cover

The top page of your report should carry the following information in printed form:
Soft bound reports should have transparent cover and
B. Tech Seminar
Title of Seminar
Name of Student
Roll Number
Panel Number
Initials of Guide
Copy for: [Guide/Internal Examiner/External/Chairperson]
Date of submission

3.2 Preliminary pages

These are constituted, in the given order, by:

1. Title page
2.Certification page
3.Acknowledgement
4.Abstract
5.Table of Contents
6.List of Figures and Tables
7.Nomenclature.

Each of these should commence on a fresh page. The preliminary pages should be numbered in small case roman numerals which should appear at the centre on the bottom.

4) CONTENT

4.1 Expectations

(i) Exhaustive survey of literature based on a clear definition of the scope and focus of the topic

(ii) Development of a theme or a unifying or classification scheme within which this literature can be reviewed and discussed cogently

(iii) critical analysis of selected studies from the literature which includes pointing out lack of or deficiency of data or information in the literature, comments on the validity of data or assumptions in theory and models, comparison of data or models, inconsistencies

(iv) summary of salient observations and trends, scope and desirability of further work in the area of review, implications on related fields, applications [adaptive strategies form the largest class, these are most successful and commercially followed] {conclusions};

4.2 Structures

It is **recommended** that the contents of the report be structured into the following categories/chapters. You may adopt a different way of organizing the material with the consent of your guide.

Introduction:

1. Statement of the problem/objective/topic; its relevance.

2. Brief description of the structure and location of contents of the report.

Literature Survey:

1. Should be as exhaustive as possible.

2. Primarily, you should discuss previous studies which specifically pertain to the problem/topic at

hand.

3. Attempt to minimize referring to work which is indirectly related to your topic. Avoid making forced connections and do not try to cram in irrelevant references.

4. The last part of this section must contain a brief mention of the gaps in the literature and a justification for undertaking your study.

Main Material:

1. *A* detailed report of previous studies, if necessary (**do not make this sound as if this is your work. Cite references properly at appropriate locations**). Attempt to understand the material that you incorporate from various references. In a seminar, such a review will form the major portion of the main material.

2. Do not restrict your references to the literature survey chapter only.

3. **Do not copy word for word from published literature.**

5) PRESENTATION

5.1 Time limits (15-20 minute)

It is a good idea to have a mock presentation with the help of your friends. **Do not expect your guide to be involved with this effort. You should attempt to organize this on your own.**

Remember more talks are ruined due to poor slides than for any other reason! So, design and prepare your slides carefully!

5.2Tips on speaking

Speak clearly and evenly (avoid elocutionary postures). Your speech must be audible enough so that it does not seem like a general murmur.

Course Outcome(CO) : Upon successful completion of this course, the student will be able to

1 Develop communication skill for effective presentation
2 Demonstrate ability to provide technical solution to a problem
3 Compile report based on literature review and technology proposed

Mapping of CO and PO

	PO												**PSO**	
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**m**	**n**
CO1					√				√	√	√	√	√	
CO2	√	√	√	√	√	√	√		√		√	√	√	√
CO3	√	√	√	√	√	√			√		√			√

Assessment Pattern

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg.
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											