

**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication**

**EX2701: Data and Network Security**

Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/week	CT – 1	15
Tutorials	00 Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Relate Mathematical concepts behind the cryptographic algorithm	L2
2.	Develop ‘hands-on’ skills on using various Security tools	L3
3.	Develop test beds in order to design network and security experiments/simulations.	L3
4.	Develop security policies that comply with cyber security laws.	L3
5.	Evaluate the various security mechanisms like passwords, access control mechanisms, firewalls etc.	L3
6.	Interpret standard approaches in cyber security	L4

**Course Contents**

		Hours
<b>Unit 1</b>	<b>Need of security and cryptography techniques:</b> The need for Security, Security Approaches, Principles of Security, Types of Attacks Cryptography CIA AAA (Confidentiality, Integrability, availability, Authentication, Authorization, and Accountability), Privacy Plain Text and Cipher Text, Substitution Techniques, Transposition Techniques, Symmetric and Asymmetric key cryptography.	<b>06</b>
<b>Unit 2</b>	<b>Data encryption standards:</b> RSA Data Encryption Standards, Advance Encryption Standards.	<b>04</b>
<b>Unit 3</b>	<b>Internet Security Protocols:</b> Internet Security Protocols and User Authentication, Digital Signatures. Secure Socket Layer, TLS, SHTTP, TSP, SET, SSL Verses SET, 3-D Secure Protocol, Electronic Money	<b>08</b>
<b>Unit 4</b>	<b>Types of Security:</b> Email Security, Firewalls, IP Security, VPN, Passwords, Certificate-based Authentication, Kerberos, and Security Handshake Pitfalls. Operating System Security, Knowledge of windows and Linux OS audit security, OS hardening (CIS benchmarks)	<b>08</b>
<b>Unit 5</b>	<b>Security threats:</b> Types of threats, Risk and impacts, Detection methods (Honeypots, Snort). Defence techniques: Firewalls, NIDS Vulnerability assessment and Penetration Testing (PEN Test), Advance Persistence Threats (APT)	<b>08</b>
<b>Unit 6</b>	<b>Cloud and Big Data networks:</b> Database security, Cloud Security – AWS/Azure/Google, Mobile application Security NIST standards.	<b>08</b>

**Text Books**

1.	Behrouz A. Forouzan, Dedeep Mukhopadhyay “Cryptography & Network Security”, Fourth Edition, Tata McGraw Hill, New Delhi
2.	Douglas R. Stinson, “Cryptography: Theory and Practice”, Third Edition, CRC Press.
3.	William Stallings, “Cryptography and Network Security – Principles and Practices”, Pearson Education, Fourth Edition,
4.	Atul Kahate, “Cryptography and Network Security”, 2nd Edition, Tata McGraw Hill

**Reference Books**

1.	"The Design of Rijndael", Springer. J. Daemen, V. Rijmen.
2.	"An Introduction to Mathematical Cryptography", Springer. Hoffstein, Pipher, Silvermman.
3.	"Algorithmic Cryptanalysis", CRC Press. A. Joux

**Useful Links**

1.	Vlabs, “Cryptography Lab” <a href="http://cse29-iiith.vlabs.ac.in/">http://cse29-iiith.vlabs.ac.in/</a>
2.	<a href="https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-858-computer-systems-security-fall-2014/index.htm">https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-858-computer-systems-security-fall-2014/index.htm</a> “Computer Systems Security by NikolaiZeldovich& James Mickens, MIT”
3.	<a href="https://nptel.ac.in/courses/106105031/">https://nptel.ac.in/courses/106105031/</a> “Cryptography and Network Security by Debdeep Mukhopadhyay, IIT Kharagpur”-Videos and PDF
4.	<a href="https://www.youtube.com/channel/UC1usFRN4LCMcfIV7UjHNuQg/v">https://www.youtube.com/channel/UC1usFRN4LCMcfIV7UjHNuQg/v</a> “Introduction to Cryptography by Christof Paar, MIT”

## Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	-	1	-	-	-	-	-	-	-	-	2	-	-
CO 2	-	1	-	1	-	-	-	-	-	-	-	-	-	1	-
CO 3	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-
CO 4	-	1	2	1	3	-	-	-	-	-	-	-	-	-	-
CO 5	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
CO 6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	3	4	3	5	3	-	-	-	-	-	-	-	2	2	-
Avg	3	1.33	1.5	1.25	3	-	-	-	-	-	-	-	2	1	-
%	99.99	44.32	49.99	41.66	99.99	-	-	-	-	-	-	-	66.66	33.33	-

## Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5		2	10
Understand	5	5	3	10
Apply	5	5	3	15
Analyze	-	5	2	25
Evaluate	-	-	-	-
Create	-	-	-	-
TOTAL	15	15	10	60

**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication**

**EX2702: Image and Video Processing**

Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/week	CT – 1	15
Tutorials	00	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		<b>Duration of ESE</b>	<b>02 Hrs 30 Min</b>

**Course Outcomes (CO)**

Student will be able to

1.	Summarize fundamental concepts of a digital image processing system.	L2
2.	Analyze images in “Spatial” and frequency domain using various transforms.	L4
3.	Evaluate the techniques for image enhancement and image segmentation.	L5
4.	Categorize various compression techniques in Digital Image, video and standards.	L4
5.	Illustrate the various techniques of Digital Video and Video Processing.	L4
6.	Create report and presentation on recent trends in Image and video processing	L6

**Course Contents**

		<b>Hours</b>
<b>Unit 1</b>	<b>Digital Image Fundamentals:</b> The Origins of digital images, Steps in Digital Image Processing, Components, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Relationships between pixels, Color Image Processing: Color Fundamentals Color models, Pseudo color Image Processing.	<b>06</b>
<b>Unit 2</b>	<b>Image Transforms:</b> 1-D DFT, 2-D Discrete Fourier Transform and Its Inverse, Some Properties of 2D DFT, Walsh - Hadamard, Discrete Cosine Transform. Transformation: Orthogonal, Euclidean, Affine.	<b>06</b>
<b>Unit 3</b>	<b>Image Enhancement:</b> Image Negative, Log Transform, Power Law transform, Histogram equalization and Histogram Specification. <b>Spatial Domain:</b> Basics of Spatial Filtering, The Mechanics of Spatial Filtering, Generating Spatial Filter Masks – Smoothing and Sharpening Spatial Filtering. <b>Frequency Domain:</b> The Basics of Filtering in the Frequency Domain, Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Laplacian, Unsharp Masking and Homomorphic filters	<b>06</b>
<b>Unit 4</b>	<b>Image Segmentation:</b> Edge based segmentation, Edge linking and boundary detection. Hough transform, Chain codes, Boundary descriptors, Fourier descriptors, morphological operations. Threshold based segmentation, Region based segmentation, Texture based segmentation. <b>Compression:</b> Code redundancy-spatial and temporal redundancy-Measuring image information, Some Basic Compression models- Huffman coding, arithmetic coding, LZW coding, Run-Length coding, JPEG image compression, JPEG-2000 image compression.	<b>10</b>
<b>Unit 5</b>	<b>Introduction to digital Video and Video Processing</b> Introduction to Digital Video- spatial resolution, Frame rate, color, dynamic Range, bit-depth. Video Processing- Video sampling, flicker, spatial frequency response, Motion modeling and estimation, Block matching, feature matching, Parametric motion estimation, Video filtering, Deinterlacing, And Denoising.	<b>06</b>
<b>Unit 6</b>	<b>Video Compression &amp; Standards:</b> MC-DCT video compression: MPEG-1, MPEG-2 video compression, H.263/MPEG-4 video compression: Compression efficiency, MPEG-4 AVC/H.264 video compression, Scalable video coding (SVC), Error-resilient compression, Video over IP	<b>08</b>

**Text Books**

1.	Gonzalez and Woods, “Digital Image Processing”, Pearson Education, India, Third Edition.
2.	Anil K. Jain, “Fundamentals of Image Processing”, Prentice Hall of India, First Edition, 1989
3.	A. M. Tekalp, “Digital Video Processing”, Prentice Hall, 2015. ISBN 0-13-190075-7

**Reference Books**

1.	K.R. Castleman, “Digital image processing,” 2nd Ed., Pearson, 2012
2.	WPratt, “Digital Image Processing, Wiley Publication, 3 <sup>rd</sup> Edition, 2002
3.	Y. Wang, J. Ostermann, and Y.-Q. Zhang “Video Processing and Communications”, Prentice Hall, 2002. ISBN 0-13-017547-1

**Useful Links**

1.	IIT Kharagpur: <a href="https://nptel.ac.in/courses/117/105/117105079/">https://nptel.ac.in/courses/117/105/117105079/</a>
2.	IIT Kharagpur: <a href="https://nptel.ac.in/courses/117/105/117105135/">https://nptel.ac.in/courses/117/105/117105135/</a>
3.	IIT Kanpur: <a href="https://nptel.ac.in/courses/117/104/117104020/">https://nptel.ac.in/courses/117/104/117104020/</a>
4.	<a href="https://web.stanford.edu/class/ee392j/">https://web.stanford.edu/class/ee392j/</a>
5.	<a href="https://www.coursera.org/learn/digital">https://www.coursera.org/learn/digital</a>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	1	1	-	-	-	-	-	-	-	2	1	-
CO 2	3	2	1	2	2	-	-	-	-	-	-	-	2	-	1
CO 3	2	2	2	2	2	-	-	-	-	-	-	-	2	1	2
CO 4	2	2	2	2	2	-	-	-	-	-	-	-	2	1	2
CO 5	3	2	2	2	2	-	-	-	-	-	-	-	2	1	2
CO 6	2	2	2	2	2	-	-	-	2	2	-	1	2	-	2
Total	15	12	10	11	11	-	-	-	2	2	-	1	12	4	9
Avg	2.5	2	1.6	1.83	1.83	-	-	-	2	2	-	1	2	1	1.8
%	83.3	66.6	53.3	61	61	-	-	-	66.6	66.6	-	33.3	66.6	33.3	60

**1 – Low 2 – Medium 3 – High**

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	05	-	-	05
Understand	05	-	-	10
Apply	05	-	-	10
Analyze	-	05	05	15
Evaluate	-	05	05	15
Create	-	05	-	05
TOTAL	15	15	10	60

**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication**

**EX2703: Fiber Optics & Optical Network**

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	CT – 1	15
Tutorials	00	CT – 2	15
Total Credits	02	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Summarize the basic of fiber optic system	L1
2.	Identify components and characteristics of optical system	L2
3.	Estimate of various parameters of optical networks and measurement techniques.	L3
4.	Evaluate analog and digital optical link system	L5
5.	Analyze the fiber optics network mechanism	L4
6.	Apply the advance optical concept to various optical applications	L3

**Course Contents**

**Hours**

<b>Unit 1</b>	<b>Introduction to Fiber Optics:</b> Fundamentals of Light, Optics, Optical Fibers: Manufacturing, Types & Transmission Characteristics, Optical Fiber waveguide: Ray theory transmission, Electromagnetic mode theory for optical propagation	<b>04</b>
<b>Unit 2</b>	<b>Optical Sources and Detectors:</b> Optical Sources: Light-Emitting Diodes and Laser Diodes, surface-emitting LEDs, edge-emitting LEDs, super luminescent diode, Photo detectors: PIN-diode, Avalanche diode, comparison of photo detectors	<b>04</b>
<b>Unit 3</b>	<b>Optical Systems &amp; Parameters:</b> Fiber Optic cables, Signal degradation in optical fibers, power launching & coupling, optical receiver operation, digital optical link, analog optical link, optical amplifier, optical SNR, Optical Time Domain Reflectometer (OTDR), nonlinear effects in fiber optics	<b>04</b>
<b>Unit 4</b>	<b>Optical Fiber Measurement:</b> Fiber attenuation measurement, Fiber Dispersion measurement, Fiber refractive index profile measurement, Fiber cutoff wavelength measurement, Fiber numerical aperture measurement, Fiber diameter measurement, Field measurement, Performance measurement & monitoring, Optical power budget, Rise time budget	<b>06</b>
<b>Unit 5</b>	<b>Fiber Optic Networks:</b> Optical network Concepts, Optical network transmission mode, layers & protocols, wavelength routing networks, SONET/SDH, Optical switching networks, Optical network deployment, Optical Ethernet, Network protection, restoration and survivability	<b>06</b>
<b>Unit 6</b>	<b>Advanced Optical System:</b> Advanced modulation formats, Demodulation scheme, Shot Noise and Bit-Error Rate, Recent progress, Ultimate channel capacity, Wavelength converters, Ultrafast optical switching, Optical regenerators, Fiber Optics Security concerns	<b>04</b>

**Text Books**

1.	J. Senior, “Optical Fiber Communications. Principle and Practice,” Prentice Hall
2.	Govind Agrawal, “Fiber-Optic Communication Systems,’ 4th Ed., Wiley, 2010.
3.	G. Keiser, “Optical Fiber Communications”, Tata McGraw-Hill Education, 4th Ed., 2008.

**Reference Books**

1.	A.Ghatak and K.Thyagrajan, “Introduction to Fiber Optics”, Cambridge Univ. Press
2.	FedorMitschke, “Fiber Optics: Physics and Technology”, Springer, 2nd Edition, 2016
3.	Jeff Hecht, “Understanding Fiber Optics”, Laser Light Press, 5th Edition, 2015

**Useful Links**

1.	From IIT Bombay:- <a href="https://nptel.ac.in/courses/117/101/117101054/">https://nptel.ac.in/courses/117/101/117101054/</a>
2.	From IIT, Madras:- <a href="https://nptel.ac.in/courses/108/106/108106167/">https://nptel.ac.in/courses/108/106/108106167/</a>
3.	From IIT Roorkee:- <a href="https://nptel.ac.in/courses/115/107/115107095/">https://nptel.ac.in/courses/115/107/115107095/</a>
4.	From IIT Bombay:- <a href="https://nptel.ac.in/courses/117/101/117101002/">https://nptel.ac.in/courses/117/101/117101002/</a>
5.	From IIT Kanpur:- <a href="https://nptel.ac.in/courses/117/104/117104127/">https://nptel.ac.in/courses/117/104/117104127/</a>
6.	From IIT Kanpur:- <a href="https://nptel.ac.in/courses/108/104/108104113/">https://nptel.ac.in/courses/108/104/108104113/</a>
7.	GCEK Moodle network
8.	White papers on Fiber Optics and its Security Vulnerabilities: <a href="https://sansorg.egnyte.com/dl/uSbAypvztl">https://sansorg.egnyte.com/dl/uSbAypvztl</a>

## Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	1	1	-	-	-	-	-	1	-	-	-	-	2	-
CO 2	3	2	2	1	1	-	1	-	-	-	-	-	-	2	-
CO 3	2	2	-	2	3	-	1	-	-	-	-	-	-	2	1
CO 4	2	2	2	1	2	-	-	-	1	-	-	-	-	2	-
CO 5	2	2	1	2	-	-	-	-	-	-	-	-	-	2	1
CO 6	3	2	1	-	1	-	-	-	1	-	-	-	-	2	1
<b>Total</b>	15	11	7	6	6	0	2	0	3	0	0	0	0	12	3
<b>Avg</b>	2.5	1.83	1.4	1.5	1.5	0	1	0	1	0	0	0	0	2	1
<b>%</b>	83.33	61.11	46.66	50	50	0	33.33	0	33.33	0	0	0	0	66.66	33.33
<b>1 – Low 2 – Medium 3 – High</b>															

## Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	05	-	-	05
Understand	05	-	-	10
Apply	05	-	-	10
Analyze	-	05	05	15
Evaluate	-	05	05	15
Create	-	05	-	05
<b>TOTAL</b>	15	15	10	60

**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication**

**EX2704: Machine Learning**

Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/week	CT – 1	15
Tutorials	00 Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Apply various inferential statistics techniques	L3
2.	Inspect different linear and non-linear regression techniques to formulate forecasting models	L4
3.	Analyze different clustering methods for classification	L4
4.	Interpret several classifiers for classification of given data	L4
5.	Evaluate convolution and recurrent neural networks to recognize several patterns	L5
6.	Justify deep learning algorithms to perform regularization	L5

**Course Contents**

**Hours**

<b>Unit 1</b>	<b>Review of Sampling, Estimation and Inferential Statistics &amp; Introduction to Machine Learning:</b> Sample vs. population, sampling distributions, parameter estimation, hypothesis testing, chi-square, z and f test. Machine learning techniques overview, validation techniques(cross-validations), feature reduction/dimensionality reduction	<b>03</b>
<b>Unit 2</b>	<b>Linear and Nonlinear Regression:</b> Covariance and correlation, hypothesis testing of regression model, R-square and goodness of fit, multiple regression methods, polynomial regression, regularization methods, Lasso, ridge and elastic nets, nonlinear regression, classification, forecasting models	<b>04</b>
<b>Unit 3</b>	<b>Classification Methods:</b> Naïve Bayes Classifier – Model assumptions, Probability estimation, Required data processing, M-estimates, Feature selection: Mutual information Support Vector Machines - Linear learning machines and Kernel space, Making Kernels and working in feature space, SVM for classification and regression problems, Decision trees, Ensembles methods	<b>08</b>
<b>Unit 4</b>	<b>Unsupervised Learning:</b> Distance measures, different clustering methods (distance, density, hierarchical), Distance measures, Iterative distance-based clustering, dealing with continuous,categorical values in K-Means, Constructing a hierarchical cluster, K-Medoids, k-Mode and density-based clustering, Measures of quality of clustering, K-Nearest Neighbors - Computational geometry; Voronoi Diagrams, Delaunay Triangulations, K-Nearest Neighbor algorithm, Aspects to consider while designing K-Nearest Neighbor, feature reduction/dimensionality reduction, principal component analysis (eigen values,eigen vectors, orthogonality)	<b>08</b>
<b>Unit 5</b>	<b>Artificial Intelligence and applications using Neural Networks:</b> Divide and Conquer, Greedy, Branch and Bound, Gradient Descent Neural network basics - Perceptron and MLP, FFN, Backpropagation Convolution Neural Networks - Image classification, Text classification, Image classification and hyper-parameter tuning, Emerging architectures Recurrent Neural Networks - Building recurrent neural network, Long Short-Term Memory, TimeSeries Forecasting	<b>06</b>
<b>Unit 6</b>	<b>Deep Learning:</b> Auto-encoders and unsupervised learning, Stacked auto-encoders and semi-supervised learning, Regularization - Dropout and Batch normalization.	<b>03</b>

**Text Books**

1.	H.K.DASS, "Advance Engineering Mathematics", S.Chand publications, Fifteenth revised edition,2006
2.	Max Kuhn and Kjell Johnson, "Applied Predictive Modeling", Springer; 2nd printing 2018 edition
3.	John D. Kelleher, Brian Namee, Aoife D'arcy, "Fundamentals of Machine Learning for Predictive Data Analytics",2015, The MIT Press
4.	Ian Goodfellow, YoshuaBengio and Aaron Courville, "Deep Learning", The MIT Press; Illustrated edition, 2016

**Reference Books**

1.	Trevor Hastie, Robert Tibshirani, and Jerome Friedman, "The Elements of Statistical Learning: Data Mining, Inference, and Prediction", Springer; 2nd edition, 2016
2.	Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson, 3rd edition, 2010
3.	AurélienGéron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems", O'Reilly Media; 1st edition, 2017

**Useful Links**

1.	<a href="https://medium.com/@luckecianomelo/mathematics-for-machine-learning-review-part-i-fef3ed813f21">https://medium.com/@luckecianomelo/mathematics-for-machine-learning-review-part-i-fef3ed813f21</a>
2.	<a href="http://www.amlbook.com/support.html#_echapters">http://www.amlbook.com/support.html#_echapters</a>
3.	<a href="https://www.khanacademy.org/math/calculus-home/multivariable-calculus">https://www.khanacademy.org/math/calculus-home/multivariable-calculus</a>
4.	<a href="https://nptel.ac.in/courses/106/106/106106139/">https://nptel.ac.in/courses/106/106/106106139/</a>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	2	1	1	-	-	-	-	-	-	-	2	-	-
CO 2	3	2	2	2	2	-	-	-	-	-	-	-	2	-	-
CO 3	2	2	2	2	2	-	-	-	-	-	-	-	2	-	-
CO 4	2	3	2	2	2	-	-	-	-	-	-	2	2	-	-
CO 5	2	2	2	2	2	-	-	-	-	-	-	-	2	-	1
CO 6	2	3	2	2	2	-	-	-	-	-	-	2	2	-	1
Total	14	14	12	11	11	-	-	-	-	-	-	4	12	-	2
Avg	2.33	2.33	2	1.83	1.83	-	-	-	-	-	-	2	2	-	1
%	77.66	77.66	66.66	61	61	-	-	-	-	-	-	66.66	66.66	-	33.33
<b>1 – Low 2 – Medium 3 – High</b>															

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	-	-	-	-
Understand	5	-	-	10
Apply	5	5	4	10
Analyze	5	5	2	10
Evaluate	-	5	2	10
Create	-	-	2	10
TOTAL	15	15	10	60



**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication**

**EX2715: Multirate Signal Processing and Wavelet**

Teaching Scheme		Examination Scheme	
Lectures	02Hrs/week	CT – 1	15
Tutorials	01Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Demonstrate Multirate Signal Processing and its applications.	L2
2.	Apply the techniques of power spectrum estimation in signal processing applications.	L3
3.	Estimate linear prediction and optimum linear filters.	L5
4.	Illustrate the limitations of Fourier Transform and the significance of Wavelets.	L2
5.	Analyze Haar wavelet.	L4
6.	Create report and presentation on applications of signal processing tools to speech, audio, image and video signals.	L6

**Course Contents**

	Course Contents	Hours
<b>Unit 1</b>	Multirate Signal Processing: Introduction, Downsampling and Upsampling Interpolation and Decimation, Sampling Rate Conversion by Non-Integer Factor, Multistage Interpolation and Decimation, Polyphase Decomposition, Applications of Multirate Signal Processing.	<b>05</b>
<b>Unit 2</b>	<b>Power Spectrum Estimation:</b> Non Parametric Method of Power Spectrum Estimation: Periodogram, Modified Periodogram, Barlett Method, Welch's Method, Blackman-Tukey Approach Parametric Methods of Power Spectrum Estimation: Auto Regressive Spectrum Estimation, Model Parameters-Yule-Walker Equation, Least Square Method and Linear Prediction, Moving Average Spectrum Estimation, Autoregressive Moving Average Spectrum Estimation Eigen Analysis Algorithm for Spectrum Estimation.	<b>06</b>
<b>Unit 3</b>	<b>Linear Prediction and Optimum Linear Filters:</b> Representation of Stationary Random Process, Forward and Backward Linear Prediction, Solution of Normal Equation, AR Lattice and ARMA Lattice Ladder Filters, Weiner Filters for Filtering and Prediction	<b>06</b>
<b>Unit 4</b>	<b>Wavelet:</b> Introduction-limitation of Fourier transform, Origin of Wavelets, Haar Wavelet, Dyadic Wavelet, Dilates and Translates of Haar Wavelets L2 norm of a function.	<b>05</b>
<b>Unit 5</b>	<b>Filter Banks:</b> Introduction to Filter Bank, Haar Analysis Filter Bank in Z-domain, Haar Synthesis Filter Bank in Z-domain.	<b>05</b>
<b>Unit 6</b>	<b>Applications of Multirate Signal Processing &amp; Wavelet:</b> Applications of Multirate signal processing & wavelet in Speech, audio, image, and video compression & Signal denoising. Create report and presentation on applications of signal processing tools to speech, audio, image and video signals.	<b>05</b>
<b>Note</b>	<b>Tutorials will be based on problem solving in Multirate signal processing, power spectrum estimation and linear filters etc.</b>	

**Text Books**

1.	Vikram Gadre and Aditya abhyankar Multiresolution and Multirate Signal Processing McGraw Hill Education; First edition, 2017
2.	S. Mallat, "A Wavelet Tour of Signal Processing," Academic Press, Second Edition, 1999
3.	P. P. Vaidyanathan, "Multirate Systems and Filter Banks," Prentice Hall, 1999

**Reference Books**

1.	M. Vetterli, J. Kovacevic, and V. K. Goyal, "The World of Fourier and Wavelets: Theory, Algorithms and Applications"
2.	Barbara Burke Hubbard, "The World according to Wavelets - A Story of a Mathematical Technique in the making", 2nd edition, Universities Press (Private) India Limited 2003
3.	Raghuveer M. Rao and Ajit S. Bopardikar, —Wavelet Transforms, —Introduction to Theory and Applications, Pearson Education Asia 2000.

4	Emmanuel C. Ifeakor, Barrie W. Jervis, —Digital Signal Processing A Practical Approach, Pearson Education 2008
<b>Useful Links</b>	
1.	<a href="https://nptel.ac.in/courses/117/101/117101001/">https://nptel.ac.in/courses/117/101/117101001/</a>
2.	<a href="https://www.youtube.com/watch?v=_MdjuI47k8E&amp;list=RDCMUCYa1WtI-vb_bx-anHdmpNfA&amp;start_radio=1&amp;t=13s">https://www.youtube.com/watch?v=_MdjuI47k8E&amp;list=RDCMUCYa1WtI-vb_bx-anHdmpNfA&amp;start_radio=1&amp;t=13s</a>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO7	PO8	PO 9	PO 10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	3	-	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-	-	2	-
CO 3	2	1	3	2	-	-	-	-	-	-	-	-	-	1	1
CO 4	3	2	2	2	-	-	-	-	-	-	-	-	-	2	2
CO 5	2	2	2	-	-	-	-	-	-	-	-	-	-	-	2
CO 6	3	2	2	1	3	-	-	-	2	2	-	-	3	1	2
Total	14	12	11	5	3	-	-	-	2	2	-	-	5	8	7
Avg	2.33	2	2.2	1.66	3	-	-	-	2	2	-	-	2.5	1.6	1.75
%	77.66	66.66	73.32	55.32	99.99	-	-	-	66.66	66.66	-	-	83.32	53.32	58.32
<b>1 – Low 2 – Medium 3 –High</b>															

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	-	-	-	10
Understand	-	05	05	10
Apply	05	05	05	10
Analyze	05	05	-	10
Evaluate	05	-	-	10
Create	-	-	-	10
TOTAL	15	15	10	60

**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication**

**EX2725: Soft Computing.**

Teaching Scheme		Examination Scheme	
Lectures	02Hrs/week	CT – 1	15
Tutorials	01Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Identify soft computing techniques	L3
2.	Apply fuzzy logic to solve uncertainty in engineering	L3
3.	Inspect on paradigms available for Fuzzy decision making.	L4
4.	Apply genetic algorithms to optimization problems	L3
5.	Examine various software tools to solve real life problems	L4
6.	Create report and presentation on recent development in soft computing.	L6

**Course Contents**

**Hours**

<b>Unit 1</b>	<b>Introduction to Soft Computing:</b> What is soft computing? Differences between soft computing and hard computing, Soft Computing constituents, Methods in soft computing, Applications of Soft Computing.	<b>04</b>
<b>Unit 2</b>	<b>Fuzzy logic:</b> Introduction to Fuzzy logic. <b>Fuzzy sets:</b> union, intersection complement <b>Fuzzy relations:</b> Cardinality, operations, properties and <b>Membership functions:</b> Features, Fuzzification, Value assignment methods. <b>Defuzzification techniques:</b> Max membership, Mean membership, Centroid methods.	<b>06</b>
<b>Unit 3</b>	<b>Fuzzy Rules:</b> Formation of Rules, propositions. <b>Reasoning:</b> Categorical, Qualitative Syllogistic Dispositional, <b>Inferences:</b> Mamdani, Takagi-Sugeno (TS) method. <b>Fuzzy Decision Making:</b> individual, multi-person, multi objective, multi-attribute, Fuzzy Bayesian. Fuzzy logic Control system	<b>06</b>
<b>Unit 4</b>	<b>Genetic Algorithms:</b> Concept of "Genetics" and "Evolution" . <b>GA Terminologies:</b> Individuals, Genes, Fitness, Populations. <b>GA operators:</b> Encoding, Crossover, Selection, Mutation <b>GA algorithms:</b> messy, adaptive, Parallel, real coded Genetic algorithm	<b>06</b>
<b>Unit 5</b>	<b>Soft Computing and Conventional AI:</b> AI search algorithm - Predicate calculus - Rules of inference - Semantic networks - Frames - Objects - Hybrid models - Applications.	<b>04</b>
<b>Unit 6</b>	<b>Swarm Intelligence:</b> Introduction to swarm intelligence. Co- relate the animal behavior in swarm intelligence. particle swarm optimization, ant colony optimization	<b>04</b>
<b>Note</b>	<b>Tutorial will be based on: Overview of Fuzzy logic and Genetic algorithm tool box in Matlab.</b> <b>Fuzzy logic applications:</b> Traffic control, liquid level controller, power system control, robotic control. etc <b>Genetic algorithm applications:</b> sorting networks, bidding strategies, immune system, Travelling salesman Problem, Rocket engine Control. Collection of information about recent development in soft computing.	

**Text Books**

1. Principle of soft computing Author: S.N. Shivanandam Publication: Wiley
2. Genetic Algorithms In Search, Optimization And Machine Learning, David E. Goldberg, Pearson Education, 2002.

**Reference Books**

1. Soft Computing, D. K. Pratihari, Narosa, 2008.
2. George J. Klir, Bo Yuan, Fuzzy sets & Fuzzy Logic, Theory & Applications, PHI Publication, 1st Edition, 2009.

**Useful Links**

1. <https://nptel.ac.in/courses/106/105/106105173/>

## Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO7	PO8	PO 9	PO 10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	2	-	2	-	-	-	2	-	2	2	2	-	
CO2	3	3	-	3	2	-	-	-	-	-	2	-	3	-	
CO 3	3	3	3	3	2	-	-	-	-	3	2	-	-	-	
CO 4	2	2	3	2	2	-	-	-	2	2	2	-	-	-	2
CO 5	-	3	3	-	2	-	-	-	3	-	2	-	-	-	
CO 6	2	2	2	2	2	-	-	-	-	-	2	2	2	-	2
Total	12	15	13	10	12	-	-	-	7	-	12		7	-	4
Avg	2.4	2.5	2.6	2.5	2	-	-	-	2.33	2.5	2	2	2.33	-	2
%	80	83.33	86.66	83.33	66.66	-	-	-	77.77	83.33	66.66	66.66	77.77	-	66.66

## Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5			
Understand	5		2	10
Apply	5	5	2	10
Analyze		5	2	10
Evaluate		5	2	15
Create			2	15
TOTAL	15	15	10	60

**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication**

**EX2735: Mixed Signal IC Designing**

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	CT – 1	15
Tutorials	01 Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Differentiate between Analog, Digital and Mixed Signal CMOS Integrated Circuits.	L4
2.	Apply the MOS circuit for the different blocks.	L3
3.	Analyze the parameters of mixed-signal design.	L4
4.	Develop various data converter architecture circuits.	L3
5.	Explain the integrated circuit of oscillators and PLLs	L2
6.	Create report and presentation on recent advances in mixed-signal design processes	L6

**Course Contents**

**Hours**

<b>Unit 1</b>	Analog versus discrete-time signals, MOS transistor as sampling switch, active resistances, current source and sinks, current mirror and current amplifiers, Voltage and current references, bandgap voltage reference, Beta-Multiple referenced self-biasing, and Mixed-signal layout issues.	<b>05</b>
<b>Unit 2</b>	Switched capacitors circuits, Switched capacitors amplifiers, Switched capacitors filters - Non idealities in switched-capacitor filters; Switched capacitor filter architectures; Switched-capacitor filter applications,	<b>05</b>
<b>Unit 3</b>	The trans-conductance operational amplifier (OTA), two-stage CMOS operational amplifier, CMOS operational amplifiers compensation, cascade operational amplifier, and folded cascade amplifier	<b>06</b>
<b>Unit 4</b>	LCoscillators, and Voltage Controlled Oscillators. Simple PLL, Charge pumps PLLs, Nonideal effects in PLLs, Delay Locked Loops.	<b>06</b>
<b>Unit 5</b>	Basics of data converters, Data converter SNR: An overview, Clock Jitter, Improving SNR using Averaging, Successive approximation ADCs, Dual slope ADCs, Flash ADCs, Pipeline ADCs, High-resolution ADCs, DACs.	<b>04</b>
<b>Unit 6</b>	The importance of signal integrity - Electromagnetic fundamentals for signal integrity, cross talk, differential signaling, electro-migration, antenna effect.	<b>04</b>
<b>Note</b>	Tutorial will be based on implementation of MOS transistor, differential amplifier, comparator, switched capacitor, PLL, ADC & DAC etc. using MICROWIND / Icarus Verilog/ open source software Magic VLSI (mentioned in usefullinks (3)) for physical design as per target specification	

**Text Books**

1. B. Razavi, “Design of Analog CMOS Integrated Circuits”, first edition, McGraw Hill, 2001
2. Harry W. Li and David E Boyce, “CMOS Circuit Design, Layout, Stimulation”, PHI Edition, 2005

**Reference Books**

1. P.E.Allen and D R Holberg, “CMOS Analog Circuit Design”, second edition, Oxford University Press, 2002
2. Gray, Meyer, Lewis and Hurst “Analysis and design of Analog Integrated Circuits”, 4th Edition Willey International, 2002
3. CMOS Circuit Design, Layout and Simulation by R.Jacob Baker, Wiley India, IEEE Press, Second Edition, reprint 2009.
4. Analog VLSI Signal and Information Processing, Ismail and Faiz, Mc Graw -Hill

**Useful Links**

1. <https://nptel.ac.in/courses/117/101/117101105/>
2. <http://www.ee.iitm.ac.in/~nagendra/teaching.html>
3. <http://opencircuitdesign.com/>
4. <https://nptel.ac.in/courses/117/106/117106034/>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO 2	3	2	1	1	2	-	-	-	-	-	-	1	3	-	2
CO 3	2	2	2	1	2	-	-	-	-	-	-	1	3	--	1
CO 4	2	2	2	1	2	-	-	-	-	-	-	-	2	-	1
CO 5	1	1	-	-	1	-	-	-	-	-	-	-	1	-	-
CO 6	2	2	1	-	2	-	-	-	2	2	-	2	-	-	--
Total	12	11	7	3	9				2	2	-	4	12	-	4
Avg	2	1.83	1.4	1	1.8	-	-	-	2	2	-	1.33	2.4	-	1.33
%	66.66	61.11	46.66	33.33	60	-	-	-	66.66	66.66	-	44.44	80	-	44.44
<b>1-Low 2-Medium 3-High</b>															

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand	5			10
Apply	10	10		10
Analyze		5		20
Evaluate				20
Create			10	
TOTAL	15	15	10	60

**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication**

**EX2745: Automotive Electronics**

Teaching Scheme		Examination Scheme	
Lectures	02Hrs/week	CT – 1	15
Tutorials	01Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Identify vehicle system components and tools.	L3
2.	Solve automotive electronics problems	L3
3.	Explain the automotive control, security and warning system.	L4
4.	Summarize principles, application, construction and specification of different sensors and actuators usable in typical automobile electronics.	L2
5.	Compare hybrid and electrical vehicles	L5
6.	Apply the new trends in Automotive Electronic vehicles	L3

**Course Contents**

**Hours**

<b>Unit 1</b>	<b>Introduction</b> Basic of automotive engineering, vehicle specifications, automotive jargon and vocabulary, fundamentals of engines, transmission, steering, suspension, brakes, comfort and convenience systems.	<b>04</b>
<b>Unit 2</b>	<b>Vehicle sensors and actuators</b> Vehicle electrical and electronics system requirements. Battery, starting and charging systems, concept of vehicle electrical transients, load-dumps and protective measures for electronic control units. Concepts of Electrostatic discharge and protection. Vehicle electronic systems, Body control modules, Sensors and actuators, smart sensors, Vehicle application case study	<b>05</b>
<b>Unit 3</b>	<b>Vehicle control systems</b> Engine control unit (ECU), Chassis control systems, Digital engine control systems, Introduction to automotive controllers, (ABS) anti lock braking system, (ESP) Electronic Stability Program , (TCS) Traction control system, (ACC) Adaptive cruise control, Active Suspension System, Automatic transmission, X-by-wire systems , Automotive alarm systems, Vehicle immobilization & deactivation, Driver information systems, Parking systems, Central locking system and electric windows, Occupants and driver safety systems Seat belt lighteners and air-bags, Fault tolerant schemes, Autonomous Vehicles	<b>05</b>
<b>Unit 4</b>	<b>Basics of EV and Hybrid vehicles</b> Basic of electrical and hybrid vehicles, architectures of EV/HEV, major types of traction motors, battery systems	<b>04</b>
<b>Unit 5</b>	<b>Trends in Automotive Electronic vehicles</b> Electromagnetic interference Suppression, Electromagnetic Compatibility, Electronic Dashboard Instruments, Onboard Diagnostic System, Security, Warning System, infotainment and Telematics, Vehicle System of Systems in the Internet of Things, Energy Management Systems, Advanced Driver Assistance System (ADAS) and Autonomous Vehicles, Automotive Ethernet, Connected and Autonomous Vehicles	<b>05</b>
<b>Unit 6</b>	<b>Case studies</b> various sensor and actuators verifying its operational details , introduction to automotive part manufacturing company, Discussion about automotive vehicle manufacturing company, energy calculation and batteries requirements, security controls	<b>04</b>
	<b>Tutorials</b> <b>Visit to automotive part manufacturing company.</b> <b>Visit to automotive part manufacturing company.</b> <b>Introduction to various automotive sensors.</b>	

**Text Books**

1.	Robert Bosch Gmbh (Ed) Bosch Automotive Electrics and Automotive Electronics Systems and Components, Networking and Hybrid Drive, 5th edition, John Wiley & Sons Inc., 2007.
2.	Young A.P. & Griffiths. L. “Automotive Electrical Equipment”, ELBS & New Press -1999.
3.	W. Hillier and David R. Rogers, “Hillier’s Fundamentals of Motor Vehicle Technology, Book 3 – Chassis and Body Electronics”, Fifth Edition, Nelson Thornes Ltd, 2007.

**Reference Books**

1.	Hybrid electric vehicles. 2. Fuel cells. I. Ehsani, Mehrdad. II. Title. III. Series.
2.	William B. Ribbens, Understanding Automotive Electronics, 6th Edition, Elsevier Publishing.
<b>Useful Links</b>	
1.	<a href="https://www.ti.com/applications/automotive/overview.html">https://www.ti.com/applications/automotive/overview.html</a>
2.	<a href="https://www.udemy.com/topic/automobile-engineering/">https://www.udemy.com/topic/automobile-engineering/</a>

### Mapping of COs and POs

PO → CO ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	1								2	-	2
CO2	2	3	2	-	2								2	-	1
CO3	3	2	-	2	-								-	1	-
CO4	3	2	2	-	1								2	-	1
CO5	2	-	1	-	-								2	-	-
CO6	2	-	1	-	1								2	-	-
<b>Total</b>	14	9	8	2	5	-	-	-	-	-	-	-	10	1	4
<b>Avg</b>	2.33	2.25	1.6	2	1.25	-	-	-	-	-	-	-	2	1	1.33
<b>%</b>	77.65	74.99	53.32	66.6	41.6	-	-	-	-	-	-	-	66.6	33.33	44.3

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	-	-	-	05
Understand	5	5	5	30
Apply	5	-	-	10
Analyze	5	5	5	10
Evaluate	-	5	-	05
Create	-	-	-	-
<b>TOTAL</b>	15	15	10	60



**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication**

**EX2755:4G/5G Communication Technology**

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	CT – 1	15
Tutorials	01 Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Explain the basics of LTE (Long Term Evolution). Standardization phases and specifications..	L2
2.	Compare the system architecture of LTE (Long Term Evolution).	L5
3.	Analyze the role of LTE radio interface protocols in 4G Technology.	L4
4.	Illustrate the main factors affecting LTE performance including mobile speed and transmission bandwidth.	L2
5.	Interpret the system of architecture and protocol stack in aspect of Layer 2 and Layer 3 of 5G .	L2
6.	Develop practical considerations, implementation, and deployment issues.	L3

**Course Contents**

**Hours**

<b>Unit 1</b>	<b>Wireless Fundamentals:</b> Cellular concept, Broadband wireless channel (BWC), Fading in BWC, Modeling BWC Empirical and Statistical models, Mitigation of Narrow band and Broadband Fading	<b>04</b>
<b>Unit 2</b>	<b>Multicarrier Modulation:</b> OFDM basics, OFDM in LTE, Timing and Frequency Synchronization, PAR, SC-FDE, OFDM and SC-FDMA: OFDM with FDMA, TDMA, CDMA, OFDMA, SC-FDMA, OFDMA and SC-FDMA in LTE Multiple Antenna Transmission and Reception: Spatial Diversity overview, Receive Diversity, Transmit Diversity, Interference cancellation and signal enhancement, Spatial Multiplexing, Choice between Diversity, Interference suppression and Spatial Multiplexing	<b>07</b>
<b>Unit 3</b>	<b>LTE (Long Term Evolution) Architecture:</b> Introduction to LTE, Channel Structure of LTE, Downlink OFDMA Radio Resource, Uplink SC-FDMA Radio Resource. <b>Radio Resource Management and Mobility Management:</b> PDCP overview, MAC/RLC overview, RRC overview, Mobility Management, Intercell Interference Coordination	<b>07</b>
<b>Unit 4</b>	<b>5G Network Architecture:</b> Design principles and network topologies, C-RAN and V-RAN architectures and disaggregated base station model SDN/NFV/MEC, Network slicing, Reference architectures, and Network entities and interfaces.	<b>05</b>
<b>Unit 5</b>	<b>New Radio Access Layer 2 and Layer 3 Aspects and System Operation:</b> Overview of layer 2 and layer 3 functions, Layer 2 functions and services, Layer 3 functions and services, UE states and state transitions, Scheduling and RRM, DRX and power saving modes, Mobility management, handover and UE measurements, Random-access procedure, Multi-connectivity, and Carrier aggregation, 5G Protocol Stack in aspect of 5G Layer 1, 5G Layer 2, 5G Layer 3	<b>05</b>
<b>Unit 6</b>	<b>Internet of Things and Vehicle to Everything (V2X) Communications:</b> General aspects, use case studies of V2X communication and architecture, Physical layer aspects, Layer 2/3 aspects, Implementation considerations.	<b>04</b>
	<b>Note:</b> <b>Tutorials should be on following topics:</b> <ul style="list-style-type: none"> <li>- 4G technologies as on web-based communications.</li> <li>- Application of 4G as Multimode Software and Video Network Coding for 4G Wireless networks</li> <li>- 5G architecture in aspects of Internet of Things and Vehicle to Everything (V2X) Communications.</li> <li>- Students will create report and presentation on recent trends on real time application and issues in mobile communication.</li> <li>- Network Access Security in 5G Mobile Networks.</li> <li>- Practical base study on throughput changes while going 4G to 5G and carrier aggregation.</li> </ul>	

**Text Books**

1.	Arunabha Ghosh, Jun Zhang, Jeffrey G. Andrews, Rias Muhamed, "Fundamentals of LTE", 2010, Publisher(s): Pearson
2.	Sassan Ahmadi, "5G NR, Architecture, Technology, Implementation, and Operation of 3GPP New Radio
3.	Kan Zheng, Wei Xiang, Xuemin (Sherman) Shen, "5G Mobile Communications", first edition, Springer, 2016.

### Reference Books

1.	Erik Dahlman, Stefan Parkvall, Johan Skold "4G: LTE/LTE-Advanced for Mobile Broadband," 2nd Ed., Elsevier, 2014
2.	Harri Holma and Antti Toskala, "LTE for UMTS Evolution to LTE-Advanced", Second Edition - 2011, John Wiley & Sons, Ltd.
3.	Afif Osseiran, Jose F. Monserrat, Patrick Marsch, "5G Mobile and Wireless Communications Technology", first edition, Cambridge University Press, 2016.

### Useful Links

1.	IIT Kanpur: <a href="https://nptel.ac.in/courses/117/104/117104099/">https://nptel.ac.in/courses/117/104/117104099/</a>
2.	<a href="https://www.coursera.org/lecture/smart-device-mobile-emerging-technologies/4-7-5g-architecture-6KzD8">https://www.coursera.org/lecture/smart-device-mobile-emerging-technologies/4-7-5g-architecture-6KzD8</a>
3.	<a href="https://www.udemy.com/course/5g-4g-lte-3g-2g-cellular-mobile-communications-wireless/">https://www.udemy.com/course/5g-4g-lte-3g-2g-cellular-mobile-communications-wireless/</a>
4.	<a href="https://www.udemy.com/course/5g-networks-security-architecture-and-procedures-5g-training/">https://www.udemy.com/course/5g-networks-security-architecture-and-procedures-5g-training/</a>

### Assignments and Tutorial will be based on:

1. Study and discussion on Application of 4G and 5G technology in recent trends.
2. Solving analytical design of development issues.
3. Frequency spectrum allocation and utilization in terms of 4G and 5G Technology
4. Developing real time mini project on related technology
5. Advancement of existing technology in mobile communication
6. Presentation and evaluation of projects on recent mobile communication techniques.
7. Review on Literature collection of advance mobile communication.
8. Use of different software and hardware tools for study of advance mobile communication.

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12		PSO 1	PSO 2	PSO 3
CO 1	3	1	1	1	1	-	-	-	-	-	-	-		-	2	-
CO 2	3	1	1	1	1	-	-	-	-	-	-	-		-	2	-
CO 3	2	2	2	1	1	-	-	-	-	-	-	-		-	2	1
CO 4	2	2	2	2	1	-	-	-	-	-	-	-		-	2	1
CO 5	2	1	1	1	1	-	-	-	-	-	-	-		-	2	1
CO 6	2	2	2	2	1	-	-	-	2	2	-	1		-	2	1
Total	14	9	9	9	6	-	-	-	2	2	-	1		-	12	4
Avg	2.33	1.5	1.5	1.5	1	-	-	-	2	2	-	1		-	2	1
%	77.66	50	50	50	33.33	-	-	-	66.66	66.66	-	33.33		-	66.66	33.33
1 – Low 2 – Medium 3 – High																

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	05	-	-	05
Understand	05	-	-	10
Apply	05	-	-	10
Analyze	-	05	05	15
Evaluate	-	05	05	15
Create	-	05	-	05
TOTAL	15	15	10	60

**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication**

**EX2716: Speech Processing**

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs./week	CT – 1	15
Tutorials	01 Hrs./week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Illustrate the fundamentals of speech and speech production system.	L2
2.	Evaluate different speech parameters/features for speech analysis.	L5
3.	Develop algorithms to find Linear Prediction Coefficients (LPC) using different approaches.	L3
4.	Interpret various encoding techniques for representing speech.	L2
5.	Examine different speech synthesis techniques.	L4
6.	Create report and presentation on recent trends in speech processing.	L6

**Course Contents**

	Course Contents	Hours
<b>Unit 1</b>	<b>Speech Fundamentals:</b> Anatomy and physiology of speech organs, Articulatory phonetics, acoustic phonetics, acoustic theory of speech production, discrete time model for speech production, Ear physiology and psychoacoustics	<b>06</b>
<b>Unit 2</b>	<b>Speech Analysis:</b> Short Time energy, average magnitude, and zero-crossing rate, speech vs silence discrimination, Short-time autocorrelation, pitch period estimation using short-time autocorrelation, Pitch period estimation based on FFT and harmonic peak detection method, Pitch period estimation in Cepstral domain, Evaluation of formants using Cepstrum, Homomorphic Speech Processing, Mel Frequency Cepstral Coefficients (MFCC)	<b>08</b>
<b>Unit 3</b>	<b>Linear Prediction of Speech:</b> Review of lattice structure realization, Forward Linear Prediction, Different approaches for finding LPC-Autocorrelation method, Covariance method and Lattice Structure method	<b>06</b>
<b>Unit 4</b>	<b>Speech Coding: Parametric Speech Coding techniques:</b> Channel Vocoders, Linear Prediction based Vocoders, Voice Excited, Code Excited Linear Prediction, Sinusoidal Speech Coding	<b>04</b>
<b>Unit 5</b>	<b>Speech Recognition:</b> Principles of speech recognition, Speech period detection, Spectral distance measure, Structure of word recognition system, Dynamic Time Warping (DTW), Theory and implementation of Hidden Markov Model (HMM). Speaker recognition: Text dependent and Text Independent speaker recognition systems.	<b>04</b>
<b>Unit 6</b>	<b>Speech Applications:</b> Automatic Speech Recognition(ASR), Speaker Identification and Verification, Speech Enhancement	<b>04</b>
	Tutorials will be based on Speech & Audio Processing Applications and editing tools such as - Praat, Wave surfer, HTK, Cool edit, MATLAB etc. Different Audio standards such as MP3, MP4, Dolby AC3, Audio file formats. Students should prepare report and presentation on recent trends such as voice Recognition Security System, Speech for human assistance-automated transactions etc.	
<b>NOTE</b>	Tutorials will be based on speech applications, case studies, preparing and presenting reports	

**Text Books**

1.	Rabiner and Schafer, “ <i>Digital Processing of Speech Signals</i> ”, Pearson Education, Delhi, 2004.
2.	Shaila D. Apte, “ <i>Speech and Audio Processing</i> ”, Wiley India, New Delhi, 2012.
3.	Douglas O’Shaughnessy, “ <i>Speech Communications: Human &amp; Machine</i> ”, Universities Press, Hyderabad, Second Edition, 2001.

**Reference Books**

1.	Thomas F Quatieri, “ <i>Discrete-Time Speech Signal Processing – Principles and Practice</i> ”, Pearson Education, 2002.
2.	J. L. Flanagan, “ <i>Speech Analysis Synthesis and Perception</i> ”, Second edition, Springer-Verlag (1972)
3.	Ben gold and Nelson Morgan, “ <i>Speech and audio signal processing</i> ”, processing and perception of speech and music, Wiley- India Edition, Student Edition, 2006.

**Useful Links**

1.	<a href="https://nptel.ac.in/courses/117/105/117105145/">https://nptel.ac.in/courses/117/105/117105145/</a>
2.	<a href="https://www.youtube.com/watch?v=X_JvfZiGEek&amp;list=PL90C59267A925137D">https://www.youtube.com/watch?v=X_JvfZiGEek&amp;list=PL90C59267A925137D</a>
3.	<a href="https://www.youtube.com/watch?v=GxkzxTFvhDU">https://www.youtube.com/watch?v=GxkzxTFvhDU</a>
4.	<a href="https://web.ece.ucsb.edu/Faculty/Rabiner/ece259/speech%20course.html">https://web.ece.ucsb.edu/Faculty/Rabiner/ece259/speech%20course.html</a>
5.	<a href="https://www.youtube.com/watch?v=Xjzm7S_kBU">https://www.youtube.com/watch?v=Xjzm7S_kBU</a>
6.	<a href="https://www.youtube.com/watch?v=cnkVeKtaTjk&amp;t=1660s">https://www.youtube.com/watch?v=cnkVeKtaTjk&amp;t=1660s</a>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	1	1	-	-	-	-	-	-	-	-	-	-	-
CO 2	3	2	2	1	1	-	-	-	-	-	-	-	-	2	-
CO 3	2	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 4	2	2	-	1	1	-	-	-	-	-	-	-	-	2	-
CO 5	2	2	1	1	1	-	-	-	-	-	-	-	-	2	1
CO 6	2	2	2	2	2	-	-	-	2	2	-	1	1	2	1
AVG	2.33	2	1.6	1.16	1.2	-	-	-	2	2	-	1	1	2	1
%	77.77	66.66	53.33	38.88	40.00	-	-	-	66.66	66.66	-	33.33	33.33	66.66	33.33

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	-	-	-	-
Understand	04	05	-	10
Apply	05	05	03	20
Analyze	03	05	02	20
Evaluate	03	-	02	10
Create	-	-	03	-
TOTAL	15	15	10	60

**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication**

**EX2726: Big Data and Data Mining**

Teaching Scheme		Examination Scheme	
Lectures	02Hrs/week	CT – 1	15
Tutorials	01Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Explain the Data Mining fundamentals	L2
2.	Apply the methods using R programming and Python	L3
3.	Select appropriate classification and Clustering tech for data analysis.	L5
4.	Illustrate the basic concepts of Big Data and its terminology	L2
5.	Apply the MapReduce concept in distributed data environment.	L3
6.	Create reports and Presentation on recent trends in data analytic.	L6

**Course Contents**

		Hours
<b>Unit 1</b>	<b>Introduction to Big Data</b> Introduction to big data: Data, Characteristics of data and Types of digital data: Unstructured, Semi-structured and Structured, Sources of data, working with unstructured data, Evolution and Definition of big data, Characteristics and Need of big data, Challenges of big data, Data environment versus big data environment	<b>05</b>
<b>Unit 2</b>	<b>Map Reduce Programming:</b> Introduction to MapReduce, Processing data with Hadoop using MapReduce, Introduction to YARN, Components, Need and Challenges of YARN, Dissecting YARN, MapReduce application.	<b>05</b>
<b>Unit 3</b>	<b>Classification and Prediction:</b> Basic Classification and Prediction Concepts. 1. <b>Decision Tree Induction:</b> Attribute Selection Measures, Tree Pruning 2. <b>Bayesian Classification:</b> Naïve Bayes Classification. <b>Prediction:</b> Linear, Non-Linear Regression, Other regression- Based methods. <b>Evaluation &amp; Selection:</b> Accuracy and Error measures, Holdout Method, Random Subsampling, Cross Validation, Bootstrap; Comparing Classifier performance using ROC Curves.	<b>06</b>
<b>Unit 4</b>	<b>Cluster Analysis:</b> Basic Concepts, Types of Data in Cluster Analysis. Overview of basic clustering methods <b>Partitioning Methods:</b> K-Means, K-Medoids. <b>Hierarchical Methods:</b> BIRCH. <b>Density-Based Methods:</b> DBSCAN	<b>05</b>
<b>Unit 5</b>	<b>Data Mining:</b> What is Data Mining, what kind of Data, Kind of patterns to be mined. Major issues in Data Mining, Data Preprocessing: Why preprocess the Data, Descriptive Data Summarization, Data Cleaning, Data integration and Transformation.	<b>05</b>
<b>Unit 6</b>	<b>Association Mining:</b> Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Item set Mining Methods, Mining various kinds of Association Rules.	<b>06</b>
	<b>Note: To Demonstrate following task during the Tutorial Hours.</b> <ul style="list-style-type: none"> <li>• Understanding different Hadoop modes.</li> <li>• Hadoop Implementation of file management tasks,</li> <li>• Implementation of Matrix Multiplication with Hadoop Map Reduce,</li> <li>• Run a Map Reduce program to understand Map Reduce Paradigm,</li> <li>• Pi Spark</li> <li>• Implementation of K-means clustering using Map Reduce</li> <li>• Data preprocessing tasks and</li> <li>• Association rule mining on data sets</li> <li>• Classification on data sets</li> <li>• Clustering on data sets.</li> </ul>	

**Text Books**

1.	Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann 3 rd Edition
2.	G. Shmueli, N.R. Patel, P.C. Bruce, "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner", 1 st Edition, Wiley India.
3.	Big data Black book – DT Editorial services, Dreamtech press publications.

4.	Seema Acharya, SubhashiniChellappan, “Big Data and Analytics”, Wiley Publications, First Edition,2015
<b>Reference Books</b>	
1.	P. N. Tan, M. Steinbach, Vipin Kumar, “Introduction to Data Mining”, Pearson Education
2.	Michael Berry and Gordon Linoff “Data Mining Techniques”, 2nd Edition Wiley Publications
3.	Hadoop: The Definitive Guide, Tom White, Third Edition, O’Reilly, 2012.
<b>Useful Links</b>	
1.	<a href="https://www.coursera.org/specializations/big-data">https://www.coursera.org/specializations/big-data</a>
2.	<a href="http://index-of.co.uk/Big-Data-Technologies/Data%20Science%20and%20Big%20Data%20Analytics.pdf">http://index-of.co.uk/Big-Data- Technologies/Data%20Science%20and%20Big%20Data%20Analytics.pdf</a>
3.	<a href="https://nptel.ac.in/courses/106105174/">https://nptel.ac.in/courses/106105174/</a>
4.	<a href="https://www.coursera.org/specializations/big-data">https://www.coursera.org/specializations/big-data</a>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO7	PO8	PO 9	PO 10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	1	1								2	-	1
CO2	2	1	2	2	2								2	-	2
CO 3	3	2	2	2	-								2	-	-
CO 4	2	-	1	1	-								2	-	-
CO 5	3	2	2	2	2								2	-	2
CO 6	2	2	2	1	2				2	2		1	2	-	2
Total	15	9	10	9	7	0	0	0	2	2	0	1	12	0	7
Avg	2.5	1.8	1.7	1.5	1.75	0	0	0	2	2	0	1	2	0	1.75
%	83.3	60.0	55.6	50.0	58.3	0.0	0.0	0.0	66.7	66.7	0.0	33.3	66.7	0.0	58.3

### Assessment Pattern (with revised Bloom’s Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5			5
Understand		5	2	10
Apply	5	5	2	15
Analyze			2	10
Evaluate		5	2	10
Create	5		2	10
TOTAL	15	15	10	60

**Government College of Engineering, Karad****Final Year (Semester – VII) B. Tech. Electronics and Telecommunication****EX2736: RF IC Designing**

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	CT – 1	15
Tutorials	01 Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Differentiate RF models for MOSFETs, BJTs and CMOS.	L4
2.	Develop the on-chip transformer, BALUN, mixers, inductors, MIM capacitors etc.	L3
3.	Analyze the different noise occurs during the RF IC designing.	L4
4.	Develop various amplifier circuits based on RF IC.	L3
5.	Explain the various Architectures of transceiver.	L2
6.	Create report and presentation on one example of RF IC design.	L6

**Course Contents**

		Hours
<b>Unit 1</b>	Salient features of RFIC compared to MMIC, RF models for MOSFETs and BJTs, n-well, p-well, twin tub CMOS processes, substrate isolation using substrate contacts, Shallow and Deep Trenches, Mott structures, On-chip inductors and MIM capacitors and modelling, Transmission Lines and distributed components	5
<b>Unit 2</b>	LC-VCOs, Phase Noise of VCOs, Two-port oscillator method to model phase noise, Gilbert Cell Mixers, On chip BALUN, Lumped BALUN, On-chip Transformer, Marchand BALUN, Quadrature Mixer operation and design	5
<b>Unit 3</b>	Low Noise Amplifier, Source of Noise- Flicker Noise, Shot Noise, Thermal Noise, Burst Noise, Noise Figure of Cascaded Gain Stages, Ferris Formula, Match for optimum gain and noise figure, LNA topologies-Cascade and Cascade	6
<b>Unit 4</b>	Power Amplifier, Role of Power Amplifier in Communication Link, Power Amplifier Characteristics- Gain, Efficiency, Return Loss, Linearity, ACPR and ACLR, TOI, Error Vector Magnitude, Class of PAs- A, B, C, AB, D, E, F	6
<b>Unit 5</b>	Transceiver Architectures- Heterodyne, Direct Conversion, Low IF, Transmitter and Receiver Budgeting, Gain/ Power/ Noise Figure/ Linearity Budgeting, SFDR	6
<b>Unit 6</b>	Case studies based on the development of RF models like amplifiers, transmitters receivers, VCOs, etc.	5
<b>Note</b>	Tutorial will be based on implementation of RF models for MOSFETs, BJTs, on-chip BALUN, inductors, MIM capacitors, transformers, power amplifiers, etc. using microwind /ADS/ Icarus Verilog/ open source software Magic VLSI (mentioned in useful links (3)) for physical design as per target specification.	

**Text Books**

1. ID Robertson, S. Lucyszyn RFIC and MMIC Design and Technology (Materials, Circuits and Devices) 2nd Edition

**Reference Books**

1. Behzad Razavi, RF Microelectronics, Prentice Hall PTR, 1997
2. Thomas H. Lee, The design of CMOS radio-frequency integrated circuit, Cambridge University Press, 2006
3. Chris Bowick, RF Circuit Design, Newnes, 2007

**Useful Links**

1. <https://nptel.ac.in/courses/117/102/117102012/>
2. <https://designers-guide.org/design/index.html>
3. <http://www.ee.iitm.ac.in/~ani/2011/ee6240/lectures.html>
4. <http://www.nptelvideos.in/2012/12/rf-integrated-circuits.html>
5. <http://www.hp.woodshot.com/>

## Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO1 1	PO12	PSO1	PSO2	PSO3
CO 1	2	2	1										3		
CO2	3	2	1	1	2							1	3		2
CO 3	2	2	2	1	2							1	3		1
CO 4	2	2	2	1	2								2		1
CO 5	1	1			1								1		
CO 6	2	2	1		2				2	2		2			
<b>Total</b>	12	11	7	3	8	-	-	-	2	2	-	4	12	-	4
<b>Avg</b>	2	1.833	1.16	0.5	1.5				0.33	0.33		0.66	2		0.66
<b>%</b>	66.66	61.11	38.88	16.66	50				11.11	11.11		22.22	66.66		22.22

## Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand	10			10
Apply	5	10		10
Analyze		5	3	20
Evaluate			3	20
Create			4	
<b>TOTAL</b>	15	15	10	60



**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication**

**EX2746: Medical Electronics**

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	CT – 1	15
Tutorials	01 Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Summarize usage of electronics in medical field.	L1
2.	Measure Biochemical parameters like PH, Blood sugar, Blood pressure with advance techniques.	L2
3.	Apply Bio telemetry systems for health monitoring.	L3
4.	Explain Cardiac Pacemakers, DC Defibrillator, Radio Pill and Telestimulation.	L5
5.	Discuss X- Ray, X- Ray Computed Tomography.	L6
6.	Create reports on recent trends in medical imaging and expert systems for hospitals	L3

**Course Contents**

**Hours**

<b>Unit 1</b>	<b>Electro-Physiology fundamentals And Bio-Potential Recording:</b> Anatomy and Physiology, Physiological systems of Body, Sources of Biomedical Signals, Basic Medical instrumentation System, Origin Of Biopotentials, Bio Potential Electrodes, Biological Amplifiers Electrocardiography (ECG), Electroencephalography (EEG), Electromyography (EMG), Electroculogram (EOG), Phonocardiogram (PCG)	<b>06</b>
<b>Unit 2</b>	<b>Bio-Chemical And Non Electrical Parameter Measurement:</b> PH, PO <sub>2</sub> , PCO <sub>2</sub> , PHCO <sub>3</sub> , Elctrophoresis, Colorimeter, Photometer, Autoanalyzer, Blood Flow Meter, Cardiac Output, Respiratory Measurement, Temperature Measurement, Pulse Measurement, Blood Cell Counters, Blood Sugar Measurement, Blood Pressure Measurement.	<b>06</b>
<b>Unit 3</b>	<b>Assist Devices, Bio-Telemetry and Safety:</b> Cardiac Pacemakers, DC Defibrillator, Telemetry Principles & Bio Telemetry, Radio Pill And Tele stimulation, <b>Safety:</b> Electrical Safety In Medical Equipment, Cyber Security in Medical Devices, Remote Patient Monitoring systems, Patient data and Profile management systems.	<b>04</b>
<b>Unit 4</b>	<b>Radiological Equipments:</b> Ionizing Radiation, Diagnostic Equipment, Use of Radio Isotope In Diagnosis, Radiation Therapy, X- Ray Machine And Digital Radiography, X- Ray Computed Tomography, Standards and practices for medical instruments / devices / equipment,	<b>06</b>
<b>Unit 5</b>	<b>Modern Human Body Scanning and Imaging Systems:</b> Nuclear Medical Imaging Systems (NMRI), Magnetic Resonance Imaging Systems (MRI), Ultrasonic Imaging Systems for measurement of Bone Density, Fetal diagnosis, Thermal Imaging Systems.	<b>06</b>
<b>Unit 6</b>	<b>Patient Monitoring systems:</b> Cardiology equipments, Thermograph, Endoscopy Unit, Laser In Medicine, Diathermy Units, Medical expert systems for hospitals, Medical software, m- health, c- Health – Medical Informatics.	<b>04</b>
<b>Note</b>	Tutorial's will be based on recent Patient Monitoring systems and Pathological reports prepared by visiting various health centers and labs	

**Text Books**

1.	Claudio Becchetti, Alessandro Neri, "Medical Instrument Design and Development from Requirement to Market Placements", Wiley Publication,
2.	Leslie Cromwell, "Biomedical Instrumentation and measurement", 2nd edition, Prentice hall of India, New Delhi, .
3.	Webster John G, "Medical Instrumentation Application and Design", Wiley India, Fourth Edition, ISBN 13 : 978-81265553792

**Reference Books**

1.	R. S. Khandpur, "Bio Medical Instrumentation Technology and Applications", Tata McGraw Hill Publication, , reprint
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2.	Ananadnatarajan R. "Biomedical Instrumentation and Measurements", PHI learning Pvt. Ltd. ISBN 13: 978-8120342279
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3.	Joseph D. Bronzino, "The Biomedical Engineering Handbook", Volume 1 & 2, CRC Press, USA, 2000.
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Useful Links			
1.	<a href="https://www.goodreads.com/book/show/6089646-biomedical-instrumentation">https://www.goodreads.com/book/show/6089646-biomedical-instrumentation</a>		
2.	<a href="https://dadabav.web.app/r-s-khandpur-fke19.html">https://dadabav.web.app/r-s-khandpur-fke19.html</a>		
3.	<a href="https://www.journals.elsevier.com/biosensors-and-bioelectronics">https://www.journals.elsevier.com/biosensors-and-bioelectronics</a>		

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	1	-	2	-	-	-	-	-	-	-	2	-	-
CO 2	2	1	1	-	2	-	-	-	-	-	-	-	1	-	1
CO 3	2	2	2	-	2	-	-	-	-	-	-	-	2	1	2
CO 4	2	-	1	-	1	-	-	-	-	-	-	-	1	-	-
CO 5	2	-	1	-	1	-	-	-	-	-	-	-	1	-	1
CO 6	2	1	1	-	1	-	-	-	2	2	-	1	2	-	1
Total	14	6	7	-	9	-	-	-	2	2	-	1	9	1	5
AVG	2.33	1.5	1.16	-	1.5	-	-	-	2	2	-	1	1.5	1	1.25
%	77.65	49.99	38.66	-	49.99	-	-	-	66.66	66.66	-	33.33	49.99	33.33	41.66

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	-	-	-	10
Understand	05	-	05	10
Apply	05	05	05	10
Analyze	05	05	-	10
Evaluate	-	05	-	10
Create	-	-	-	10
TOTAL	15	15	10	60

**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication**

**EX2756: Radar Engineering**

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs./week	CT – 1	15
Tutorials	01 Hrs./week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Illustrate the fundamentals of Radar systems.	L2
2.	Solve problems on radar equations and various types of radar systems	L3
3.	Examine the working principles of CW,FM, MTI, Pulse Doppler and Tracking Radar	L4
4.	Evaluate different types of radars for specific applications.	L5
5.	Create report and presentation on recent trends in modern radar systems.	L6

**Course Contents**

		Hours
<b>Unit 1</b>	<b>The Nature of Radar:-</b> Introduction, Simple Form of Radar equation, Radar Block Diagram and operation, Radar Frequencies,Applications of Radar	<b>04</b>
<b>Unit 2</b>	<b>The Radar Equation:-</b> Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise and SNR, Integration of Radar Pulses, Radar Cross Section of Targets, Transmitter Power, Pulse Repetition Frequency	<b>06</b>
<b>Unit 3</b>	<b>CW and Frequency-Modulated Radar:-</b> Doppler effect, Simple CW radar, Frequency-modulated CW Radar, Airborne Doppler Navigation	<b>06</b>
<b>Unit 4</b>	<b>MTI and Pulse Doppler Radar:-</b> Introduction, Delay line canceller, Multiple, or Staggered Pulse Repetition Frequencies, Range-Gated Doppler Filters, Pulse Doppler radar	<b>06</b>
<b>Unit 5</b>	<b>Tracking Radar:-</b> Tracking with Radar, Sequential lobing and Conical scan, Mono-pulse tracking radar, Target-Reflection Characteristics and Angular Accuracy, Tracking in Range	<b>06</b>
<b>Unit 6</b>	<b>Detection of Radar Signals in Noise:-</b> Introduction, Matched Filter Receiver,Correlation Detection,Detection Criteria,Detector Characteristics	<b>04</b>
<b>NOTE</b>	Tutorials will be based on solving Problems on Basic Concepts of Radar,CW and Pulsed Radar,Search and Tracking Radar. Students should prepare report and presentation on Emerging and Modern Applications of Radar Principles.Design, simulation, analysis, and testing of radar systems can be done using MATLAB & Simulink, AWR or CAD FEKO software etc.	

**Text Books**

- MerillSkolnik, —Introduction to Radar Systems, Tata McGraw Hill, Third Edition
- G. S. N. Raju, —Radar Engineering and Fundamentals of Navigational Aids, I. KInternational publishing House Pvt. Ltd.
- Hovanessian, S.A., "Radar system design and analysis", ArtechHouse

**Reference Books**

- Mark A. Richards, James A. Scheer, William A. Holm, —Principles of Modern Radar, Scitech Publishing.
- Simon Kingsley, Shaun Quegon, —Understanding Radar Systems, Scitech Publishing Inc.
- Levanon, N., "Radar principles", John Wiley & Sons
- Richards, M. A., "Fundamentals of Radar Signal Processing" TataMc-Grawhill

**Useful Links**

- <https://nptel.ac.in/courses/108/105/108105154/>
- <http://www.ll.mit.edu/outreach/radar-introduction-radar-systems-online-course>
- <https://www.radartutorial.eu/07.waves/Waves%20and%20Frequency%20Ranges.en.html>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO7	PO8	PO 9	PO 10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	1	1	-	-	-	-	-	-	-	-	-	2	-
CO 2	3	2	2	1	-	-	-	-	-	-	-	-	-	2	-
CO 3	2	3	2	2	-	-	-	-	-	-	-	-	-	2	-
CO 4	3	2	2	2	-	-	-	-	-	-	-	-	-	2	-
CO 5	3	2	1	1	-	-	-	-	-	-	-	-	-	2	-
CO 6	2	2	1	2	-	-	-	-	2	2	-	1	-	2	1
AVG	2.66	2.16	1.5	1.5	-	-	-	-	2	2	-	1	-	2	1
%	88.88	72.22	50	50	-	-	-	-	66.66	66.66	-	33.33	-	66.66	33.33

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	-	-	-	-
Understand	04	02	-	10
Apply	05	05	03	20
Analyze	03	05	02	20
Evaluate	03	03	02	10
Create	-	-	03	-
TOTAL	15	15	10	60

**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication Engineering**

**EX2707 : Image and Video Processing Lab**

Laboratory Scheme		Examination Scheme	
Practical	2 Hrs/week	TA/CA	25
Total Credits	1	ESE	25
<b>Course Outcomes (CO)</b>			
Student Will be able to			
1.	Formulate MATLAB programs for smoothing thresholding, negation and filtering operation in Image.		L6
2.	Estimate the digital video signals and its compression.		L6
3.	Utilize different video Editing tools.		L3
4.	Apply different motion estimation algorithm		L3
<b>List of Experiment</b>			
<b>Experiment 1</b>	Demonstration of Image Smoothing Operation		
<b>Experiment 2</b>	Implement RGB to Gray scale Image Processing using DIPLAB-1.0 and MATLAB.		
<b>Experiment 3</b>	Demonstration negation of image using DIPLAB-1.0		
<b>Experiment 4</b>	Apply different thresholds & filters using DIPLAB-1.0 and MATLAB.		
<b>Experiment 5</b>	Demonstration of convert between color spaces and perform filtering on color images in MATLAB.		
<b>Experiment 6</b>	Perform image compression using MATLAB (Experiment with compression ratio And Calculate objective quality measures on compressed images.)		
<b>Experiment 7</b>	Design Basic digital video editing in MATLAB		
<b>Experiment 8</b>	Interpret how to read, process, and display RGB & YUV video data in MATLAB.		
<b>Experiment 9</b>	Calculation of different parameters of digital video signal (such as The frame rate , The line number ,The number of samples per line and frame interval ) and effect of their on video reproduction.		
<b>Experiment10</b>	Perform and differentiate various video compression techniques.		
<b>Experiment11</b>	Construct motion estimation using the HBMA (Hierarchical block matching algorithm) method in MATLAB.		
<b>Experiment12</b>	Design motion estimation using the Block-based motion Estimation algorithm method in MATLAB.		
<b>Experiment13</b>	How to add metadata in Image and Video		
<b>Experiment14</b>	Study on 4K/2K Image Technology		
<b>List of Submission</b>			
1	Total number of Experiments: 10		
2	Project/Dissertation Report: Open ended Project (CASESTUDY: OBJECT SEGMENTATION AND TRACKING IN THE PRESENCE OF COMPLEX BACKGROUND)		
3			

## Mapping of COs and POs

PO → CO ↓	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	1	3	-	-	-	2	1	-	1	1	2	1
CO 2	2	3	2	2	2	-	-	-	1	1	-	-	1	2	-
CO 3	2	2	1	1	3	-	-	-	2	1	-	1	1	2	-
CO 4	2	2	1	-	1	-	-	-	1	1	-	-	1	2	-
<b>Total</b>	9	9	6	4	8	-	-	-	6	4	-	2	4	8	1
<b>Avg</b>	2.25	2.25	1.5	1.33	2	-	-	-	1.5	1	-	1	1	2	1
<b>%</b>	75	75	50	44.44	66.6	-	-	-	50	33.3	-	33.33	33.3	66.6	33.3

## Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CA	ESE
Remember	-	05
Understand	-	05
Apply	05	05
Analyze	10	05
Evaluate	10	05
Create	-	-
<b>TOTAL</b>	25	25

**Government College of Engineering, Karad****Final Year (Semester – VII) B. Tech. Electronics and Telecommunication Engineering****EX2708 : Fiber Optics & Optical Networks Lab**

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

**Course Outcomes (CO)**

Student Will be able to:

1.	Summarizing the basic components in fiber optics.	L2
2.	Measure optical resources and amplifier parameters	L4
3.	Estimate Link budget and rise time	L6
4.	Develop methodology for fault diagnosis in fiber optical network using OTDR	L4

**List of  
Experiment**

<b>Experiment 1</b>	Demonstration of fiber optics components and visit to installation optical fiber network	
<b>Experiment 2</b>	Measurement of Numerical aperture	
<b>Experiment 3</b>	Determine the V-I And P-I Characteristics of Laser Source	
<b>Experiment 4</b>	Characterization of Circulator Add - Drop of Wavelength in a CWDM link	
<b>Experiment 5</b>	Implementation of Backward Pumping in Erbium Doped Fiber Amplifier	
<b>Experiment 6</b>	Measurement of Small Signal Gain and Saturation Output Power in EDFA	
<b>Experiment 7</b>	Calculation of Rise time budget & Link Power Budget	
<b>Experiment 8</b>	Identification and measurement of faults in Single mode optical Fiber using OTDR	
<b>Experiment 9</b>	Characterization of Fiber Bragg Grating (FBG )	
<b>Experiment 10</b>	Analyze the PC to PC Communication using fiber link	
<b>Experiment 11</b>	Illustrate four Channel Course Wavelength Division Multiplexing / De-Multiplexing	
<b>Experiment 12</b>	Determine the Optical Cross Talk in Adjacent Channels	
<b>List of Submission</b>		
1	Total number of Experiments: 10	
2	Field Visit Report: 01	

### Mapping of COs and POs

PO → CO ↓	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	1	2	1	1	-	-	-	2	-	-	-	-	2	1
CO 2	3	1	2	1	2	-	-	-	2	-	-	-	-	2	2
CO 3	3	1	2	2	-	-	-	-	2	1	-	-	-	2	1
CO 4	3	1	2	1	3	1	-	-	2	1	-	1	-	2	1
Total	12	4	8	5	6	1	0	0	8	2	0	1	0	8	5
Avg	3	1	2	1.25	2	1	0	0	2	1	0	1	0	2	1.25
%	100	33.33	66.66	41.66	66.66	33.33	0	0	66.66	33.33	0	33.33	0	66.66	41.66

**1 – Low 2 – Medium 3 – High**

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CA	ESE
Remember	-	05
Understand	-	05
Apply	05	05
Analyze	10	05
Evaluate	10	05
Create	-	-
TOTAL	25	25



**Government College of Engineering, Karad****Final Year (Semester – VII) B. Tech. Electronics and Telecommunication Engineering****EX2709: Industrial Training**

Laboratory Scheme		Examination Scheme	
Practical	2 Hrs/week	CT – 1	15
Total Credits	1	CT – 2	15
		CA	-
		ESE	20

**Course Outcomes (CO)**

Student Will be able to

1.	Summarize the functions of various departments in the industry.	L2
2.	Apply the knowledge gained in academics to the industry.	L3
3.	Prioritize students to an industrial environment & its impact in societal, environmental contexts.	L5
4.	Create report about the new learning techniques, resources, and modern engineering tools.	L6
5.	Assess professional ethics & responsibilities.	L5

**Course Contents**

1.	<p>1. The students have to undergo an industrial training of minimum two weeks in an industry preferably dealing with Electronics &amp; Telecommunication Engineering and allied discipline after completion of Third year during the summer vacation.</p> <p>2. He / she will work under supervision of institute guide and industrial guide. The students have to submit a report of the training undergone and make presentation before evaluation committee constituted by the department. An internal evaluation will be conducted for examining the quality and authenticity of contents of the report and award the marks.</p> <p>3. Report is based on compilation of work carried out related to machineries, measuring instruments, state-of-art technologies, plant layout, Industry organization chart, Management functions, Safety, rules and regulations, documentation work, Industry standards, processes and tools used, fixtures and gauges used, Industrial automation, Computerization and software used in various departments, product flow, testing and quality control checks, painting and packing procedures, housekeeping practices as identified etc.</p> <p>4. Quantum and quality of work will be monitored by industrial and academic guide both.</p>	
2.	<p>1. Industrial Training Report Format: Each student should have different industrial training and its presentation. The report should be of minimum 20 pages as per guideline issued by department time to time. Discipline should be maintained in industry.</p> <p>2. Certificate: All students should attach standard format of Certificate as described by the department. Certificate should have signatures of Guide, Head of Department and Principal.</p> <p>3. The entire report should be documented as one chapter with details like “Name of Industry with address along with completed training certificate” Area in which Industrial training is completed All Students have to present their reports individually. All students should attach MoU signed with industry.</p>	

### Mapping of COs and POs

PO→ CO↓	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO 3
CO 1	1	-	-	-	2	-	-	-	2	2	1	2	1	1	1
CO 2	2	2	3	2	2	1	1	1	2	2	2	2	2	2	2
CO 3	1	1	2	2	1	2	2	3	2	2	2	2	1	1	1
CO 4	1	1	1	1	1	1	-	-	2	2	1	2	1	1	1
CO5	-	-	-	-	-	2	2	3	2	2	1	2	1	1	1
Total	5	4	6	5	6	6	5	7	10	10	7	10	6	6	6
Avg	1.25	1.33	2	1.67	1.5	1.5	1.67	2.33	2	2	1.4	2	1.2	1.2	1.2
%	41.67	44.44	66.67	55.56	50	50	55.56	77.78	66.67	66.67	46.67	66.67	40	40	40

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CA	ESE
Remember	-	-
Understand	-	-
Apply	10	5
Analyze	10	5
Evaluate	5	5
Create	-	10
TOTAL	25	25

**Government College of Engineering, Karad****Final Year (Semester – VII) B. Tech. Electronics and Telecommunication Engineering****EX2710: Project Work Phase 1**

Laboratory Scheme		Examination Scheme	
Practical	2 Hrs./week	CT – 1	15
Total Credits	1	CT – 2	15
		CA	-
		ESE	20

**Course Outcomes (CO)**

Student Will be able to

<b>1</b>	Analyze societal & environmental needs for finalizing solutions in modern ways.	L4
<b>2</b>	Propose optimize solutions for complex engineering problem.	L6
<b>3</b>	Evaluate the project in terms financial feasibility, power consumption, technical performance, market sustainability, flexibility, etc.	L5
<b>4</b>	Create report about the new learning techniques, resources, and modern engineering tools.	L6

**Course Contents**

	<p><b>The project work will be carried a topic related to the Electronics &amp;Telecommunication Engineering and allied fields. Selected topic needs to be</b></p> <ol style="list-style-type: none"> <li>1. Development of innovative &amp; productive idea in the area of Electronics &amp;Telecommunication Engineering &amp; allied domain</li> <li>2. Economically feasible &amp; may be modification in an existing electronics system.</li> <li>3. Practical need of the industry, which should involve system design aspect.</li> <li>4. Implementation of innovative work leading to comfort of human life (Interdisciplinary Real- Life Applications) may lead to startup &amp;patenting.</li> </ol>	
	<p><b>Evaluation will be based on following criteria:</b></p> <ol style="list-style-type: none"> <li>1. Justification of domain, title, idea of project, Scope.</li> <li>2. Literature review for last 3 Years to do the gap analysis.</li> <li>3. System Modeling, Requirement of Major Components, Hardware and Software.</li> <li>4. Implementation of proposed project work (Roadmap, Methodology/Algorithms, block schematic, Progressive chart, activity chart with deadline, Finalization of design, etc)</li> </ol>	

### Mapping of COs and POs

PO → CO ↓	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	2	2	2	2	2	3	2	2	2	2	2	2	2	2
CO 2	2	2	3	2	2	-	-	-	1	1	1	1	2	2	2
CO 3	2	2	1	1	1	-	2	-	1	2	3	1	2	2	2
CO 4	1	1	1	1	1	1	-	-	2	2	1	2	2	2	2
Total	6	7	7	6	6	3	5	2	6	7	7	6	8	8	8
Avg	1.5	1.75	1.75	1.5	1.5	1.5	2.5	2	1.5	1.75	1.75	1.5	2	2	2
%	50	58.33	58.33	50	50	50	83.33	66.67	50	58.33	58.33	30	66.67	66.67	66.67

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CA	ESE
Remember	-	-
Understand	5	-
Apply	10	10
Analyze	5	5
Evaluate	5	5
Create	-	5
TOTAL	25	25

**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication Engineering**

**EX2711: Machine Learning Lab**

Laboratory Scheme		Examination Scheme	
Practical	2 Hrs/week	TA/CA	-
Total Credits	Audit	ESE	-

**Course Outcomes (CO)**

Student Will be able to

1.	Apply various classification techniques to given data set	L3
2.	Analyze different clustering algorithms	L4
3.	Build artificial neural network	L6
4.	Create a report and presentation on case study in Artificial Intelligence and Machine Learning	L6

**List of Experiment**

<b>Experiment 1</b>	Implement the Non-Parametric Locally Weighted Regression Algorithm in order to fit datapoints.	
<b>Experiment 2</b>	Write a program to implement the naïve Bayesian classifier for a sample training data set. Compute the accuracy of the classifier, considering few test data sets.	
<b>Experiment 3</b>	Demonstrate the working of the decision tree based ID3 algorithm.	
<b>Experiment 4</b>	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm.	
<b>Experiment 5</b>	Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Show both correct and wrong predictions.	
<b>Experiment 6</b>	Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.	
<b>Experiment 7</b>	Implement CNN for any suitable application.	
<b>Experiment 8</b>	Implement RNN for any suitable application.	
<b>Experiment 9</b>	Design, Implement SVM for classification with proper data set of your choice.	
<b>Experiment 10</b>	Application of any Deep Learning algorithm.	

**Create report & presentation on one of case studies from :**

<b>Case Study 1</b>	Churn Analysis and Prediction (Survival Modelling)	
<b>Case Study 2</b>	Credit card Fraud Analysis	
<b>Case Study 3</b>	Sentiment Analysis or Topic Mining from New York Times	
<b>Case Study 4</b>	Sales Funnel Analysis	
<b>Case Study 5</b>	Recommendation Systems and Collaborative filtering	
<b>Case Study 6</b>	Customer Segmentation and Value	
<b>Case Study 7</b>	Portfolio Risk Conformance	
<b>Case Study 8</b>	Uber Alternative Routing	
<b>Case Study 9</b>	AI in Cyber Security	
<b>Case Study 10</b>	How online shopping sites write Thousands of Email Subject Lines in Minutes	

**List of Submission**

1	Total number of Experiments: 10	
2	Total number of sheets: NA	
3	Project/Dissertation/Case study Report: 01	
4	Seminar report: NA	
5	Field Visit Report: NA	

## Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	2	2	2	2	-	-	-	-	-	-	-	2	-	1
CO 2	2	2	2	2	2	-	-	-	-	-	-	-	2	-	1
CO 3	2	2	2	2	2	-	-	-	-	-	-	-	2	-	1
CO 4	2	2	2	2	2	-	-	-	2	2	-	-	2	-	1
Total	2	2	2	2	2	-	-	-	2	2	-	-	2	-	1
Avg	10	10	10	10	10	-	-	-	4	4	-	-	10	-	5
%	66.66	66.66	66.66	66.66	66.66	-	-	-	66.66	66.66	-	-	66.66	-	33.33
<b>1 – Low 2 – Medium 3 – High</b>															

**Government College of Engineering, Karad**

**Final Year (Semester – VIII) B. Tech. Electronics and Telecommunication**

**EX2801: Legal Regulatory and Compliance**

Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/week	CT – 1	15
Tutorials	00 Hrs/week	CT – 2	15
Total Credits	03	TA	40
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Explain legal system frame work in India	L2
2.	Understand the importance of Human Rights and Commission in India.	L5
3.	Make use of the Indian business laws.	L4
4.	Elaborate the IPR	L6
5.	Interpret the cyber security law	L5
6.	Create report and presentation on recent advances in law for business and security.	L6

**Course Contents**

		Hours
<b>Unit 1</b>	<b>History and Introduction to Indian legal system:</b> Evolution of law and legal system in India; Role of the State in Ancient Indian Society; Social organizations in ancient India; What is “Law”? Is legal Development National or Planned? - Use and functions of Law in Society.	<b>05</b>
<b>Unit 2</b>	<b>Constitution of India and Human rights:</b> <b>Constitutional Law:</b> The Preamble; Fundamental Rights; Directive principles of State policy; Fundamental Duties; Emergency provisions – kinds, legal requirements and legal effects. <b>Introduction to Human Rights:</b> Theoretical foundation, Historical development of human rights; Human Rights in Indian tradition and Western tradition; Enforcement of Human Rights in India including Supreme Court, High Courts, Statutory Commissions – NHRC, NCW, NCM, NC-SC/ST etc.	<b>08</b>
<b>Unit 3</b>	<b>Indian Business laws:</b> Contract Act: Meaning and Nature of Contract, Agreement and Contract- Definitions, Elements and Kinds – e-contracts, Proposals and acceptance- Definition, Various forms, Essential elements, Communication, Revocation, Invitation for Proposal- tenders. Basic idea of Partnership, sale of goods, pledge, mortgage etc. Company Act: Company and its Nature and Scope, Procedure for Incorporation of companies, Prospectus, Shares and Debentures, Members and Membership Rights.	<b>09</b>
<b>Unit 4</b>	<b>Intellectual Property Rights:</b> Introduction–meaning of intellectual Property (IP), Main forms of IP -Patent, Copyright, Trademarks and Designs. Introduction to the Indian Patent System, Essential of Patentability of Inventions, Statutory Exceptions to Patentability, : Patent Specification Provisional and Complete Specifications, Patent Prosecution: Patent Applications, Trademark, Copyright, Geographical Indication, Traditional Knowledge, The Semiconductor Integrated Circuits Layout Design Act, The Protection of Plant Varieties and Farmers' Rights Act.	<b>08</b>
<b>Unit 5</b>	<b>Introduction to cyber and Information Technology Law:</b> Introduction to Cyber Law Cybercrime, Legal issues relating to the World Wide Web such as defamation on the internet, hacking, virus attacks, Electronic & Digital Signatures etc. Idea of IT Act 2000, Overview of Data Protection: EU General Data Protection Regulation (GDPR), Data Protection in India, Payment Card Industry Data Security Standard (PCI DSS) Security Frameworks – ISO 27001	<b>08</b>
<b>Unit 6</b>	<b>Alternative Dispute Resolution Mechanism (ADR):</b> Introduction to Arbitration, Mediation, Conciliation and Negotiation.	<b>04</b>

**Text Books**

1.	D.D. Basu, Shorter Constitution of India, Prentice Hall of India
2.	M.P. Jain, Indian Constitutional Law, Wadhwa & Co.
3.	S.K. Awasthi & R.P. Kataria, Law relating to Protection of Human Rights, Orient Publishing
4.	S.K. Kapur, Human Rights under International Law and Indian Law, Central Law Agency

**Reference Books**

1.	Avtarsingh, Law of Contract, Eastern Book
2.	Wadhwa , Intellectual Property Rights, Universal Law Publishing Co
3.	T. Ramappa, Intellectual Property Rights Law in India, Asia Law House

**Useful Links**

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1.	<a href="https://lawshelf.com/shortvideosview/contracts">https://lawshelf.com/shortvideosview/contracts</a>
2.	<a href="https://www.youtube.com/watch?v=Bb9EBtlGx7w">https://www.youtube.com/watch?v=Bb9EBtlGx7w</a>
3.	<a href="https://lawshelf.com/videocoursesmoduleview/patent-basics-module-1-of-5/">https://lawshelf.com/videocoursesmoduleview/patent-basics-module-1-of-5/</a>
4.	<a href="https://www.youtube.com/watch?v=f9zfBd_9y9k">https://www.youtube.com/watch?v=f9zfBd_9y9k</a>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	-	-	-	-	-	2	-	2	1	1	-	2	-	-	1
CO 2	-	-	-	-	1	2	1	1	1	1	-	1	-	-	1
CO 3	-	-	-	1	1	1	-	2	1	1	-	2	-	-	1
CO 4	-	-	2	-	2	1	1	2	1	1	-	2	-	-	2
CO 5	-	-	2	-	2	2	1	2	2	1	-	2	-	-	1
CO 6	-	-	-	-	2	1	1	2	2	2	-	2	-	-	2
Total	-	-	4	1	8	9	4	11	8	7	-	11	-	-	8
Avg	-	-	2	1	1.6	1.5	1	1.88	1.33	1.16	-	1.83	-	-	1.33
%	-	-	66.66	33.33	53.32	49.99	33.33	62.66	44.32	38.66	-	60.99	-	-	44.32

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5		2	10
Understand	5	5	3	10
Apply	5	5	3	15
Analyze	-	5	2	25
Evaluate	-	-	-	-
Create	-	-	-	-
TOTAL	15	15	10	60



**Government College of Engineering, Karad**

**Final Year (Semester – VIII) B. Tech. Electronics and Telecommunication**

**EX2802: Robotics**

Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/week	CT – 1	15
Tutorials	01 Hrs/week	CT – 2	15
Total Credits	04	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Identify and classify various types of industrial robots.	L2
2.	Illustrate the power transmission system for robot drive.	L2
3.	Decide gripper, sensor and actuator for specific applications.	L5
4.	Develop programming principles and languages for a robot control system.	L3
5.	Construct automation for a particular application using robot.	L3
6.	Propose robot system and prepare presentation on existing process control application.	L6

	Course Contents	Hours
Unit 1	<b>Introduction to Robot and automation:</b> Automation, Types of automation, Robotics in automation, Definition of robot, history of Robotics, law of robotics, Components and Terminology of Robotics., Wrist Mechanism, Degrees of freedom, of a robot, Classification of Robots, Specifications of robot, Application of Robotics.	6
Unit 2	<b>Robot Drive and Power transmission Systems:</b> Introduction of drive system, structure of drive system, Necessity of drive system, Characteristics of Actuating Systems, design consideration of drive system, Hydraulic and Pneumatic Systems, Electrical Actuation System, Advantages and limitations of drive system. Power transmission Systems (Gear, Belt, Chains etc.)	6
Unit 3	<b>Robotic sensor system:</b> Need of sensor, Sensor Performance Characteristics, Position sensors Velocity sensors, Accelerometers, Touch sensor, Slip sensors, Wrist Sensors, Vision sensors, Force sensor, Torque sensor, Tactile sensor, Criterion for sensor selection	5
Unit 4	<b>Control system of robot and End effectors:</b> Basic control systems concepts and models, Types of Controllers, feedback components, Adaptive control system, Design Considerations of End Effectors, Basic types of End Effectors, Gripper classification, Types of gripper mechanism, Tools, Selection criterion for End effectors.	5
Unit 5	<b>Kinematics of Robot Manipulator:</b> Co-ordinate and vector transformation using matrices, Rotation matrix, Inverse Transformations, Problems, Composite Rotation matrix, Homogenous Transformations, Robotic Manipulator Joint Co-Ordinate System, Euler Angle & Euler Transformations, Roll Pitch-Yaw (RPY) Transformation, Denavit-Hartenberg (D-H) Representation & Displacement Matrices for Standard Configurations, Jacobian Transformation in Robotic Manipulation	5
Unit 6	<b>Robot Programming:</b> Introduction to robot programming, Programming Types (Flex Pendant, Lead through programming), Interlock commands- Operating mode of robot, Jogging-Types, Motion commands, end effectors and sensors commands. VAL Programming, programming-basic commands, motion control, hand control, program control, pick and place applications, palletizing applications using VAL, Virtual robotics, Robot studio online software, cyber security in robotic applications Case Study: Application of robot for Material handling and any industrial process (Welding. Painting etc.)	5

Text Books	
1.	M.P. Groover, M. Weiss, R.N. Nagel, N.G. Odrey, "Industrial Robotics", Tata McGraw Hills Publication, Second Edition, 2017.
3.	Richard D Klafter, Thomas A Chmielewski, Michael Negin, —Robotics Engineering: An Integrated Approach, PHI Learning, New Delhi, 2009.

Reference Books	
2.	Thomas R. Kurfess, "Robotics and Automation Handbook", CRC Press, 1st edition, 2005.
2.	Ashitava Ghoshal, Robotics-Fundamental Concepts and Analysis ‘, Oxford University Press, Sixth impression, 2010.
3.	Robert J. Schilling, —Fundamentals of Robotics Analysis and Control, PHI Learning, 2011.

Useful Links	

1.	<a href="https://nptel.ac.in/courses/112/105/112105249/">https://nptel.ac.in/courses/112/105/112105249/</a> - I.I.T, Kharagpur.
2	<a href="https://see.stanford.edu/Course/CS223A">https://see.stanford.edu/Course/CS223A</a> - Stanford University, Stanford, California
3	<a href="http://nptel.ac.in/courses/112101099">http://nptel.ac.in/courses/112101099</a> - I.I.T, Bombay

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO3	PO4	PO 5	PO 6	PO 7	PO8	PO 9	PO10	PO1 1	PO12	PSO 1	PSO 2	PSO 3
CO 1	2	1	1										2		
CO2	2	1	2	1	1								3		1
CO 3	2	1	2	1	1								2		1
CO 4	2	2	3	2	2								2		2
CO 5	2	2	2	2	1								2		2
CO 6	2	3	3	2	2				2	2		1	2		2
Total	12	10	13	8	7	-	-	-	2	2	-	1	10	-	8
Avg	2.00	1.67	2.17	1.6	1.4	0.00	0.00	0.00	2	2	0	1	2.17	0.00	1.6
%	66.67	55.56	72.22	53.33	46.67	0.00	0.00	0.00	66.67	66.67	0.00	33.33	72.22	0.00	53.33

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand	5	5	2	5
Apply	5	5	3	10
Analyze				20
Evaluate	5		3	15
Create		5	2	10
TOTAL	15	15	10	60

**Government College of Engineering, Karad****Final Year (Semester – VIII) B. Tech. Electronics and Telecommunication****EX2813: DSP Processor Architecture And Algorithms**

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	CT – 1	15
Tutorials	01 Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Build the basic constituents of a digital signal processor	L3
2.	Illustrate the architecture of various DSP processor	L2
3.	Develop interfacing concepts of external memory, serial and parallel I/O devices	L3
4.	Demonstrate the basic DSP filtering algorithms on DSP processors	L3
5.	Evaluate various speech processing and image processing applications	L5
6.	Create report and presentation on recent trends in signal processing	L5

**Course Contents****Hours**

<b>Unit 1</b>	<b>Introduction to Digital Signal Processing:</b> Review of a digital signal-processing system, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear Time Invariant Systems, Digital filters IIR and FIR, Decimation and interpolation.	<b>04</b>
<b>Unit 2</b>	<b>Architectures For Programmable Digital Signal-Processors:</b> Introduction, Basic Architectural Features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Features for External Interfacing	<b>06</b>
<b>Unit 3</b>	<b>Programmable Digital Signal Processors:</b> Data Addressing Modes, Memory Space Program Control, Detail Study of TMS320C54XX and TMS320C67XX	<b>05</b>
<b>Unit 4</b>	<b>Programming:</b> Instructions and programming, On-Chip peripherals, Interrupts, Pipeline Operations, External Bus Interfacing Signals, Memory Interface, Parallel I/O Interface	<b>07</b>
<b>Unit 5</b>	<b>Implementation Of Basic DSP Algorithms:</b> Introduction, The Q-notation, FIR Filters, IIR Filters, Interpolation and Decimation Filters (one example in each case)	<b>05</b>
<b>Unit 6</b>	<b>Interfacing And Applications of DSP Processor:</b> Introduction, Synchronous Serial Interface, A CODEC Interface Circuit, DSP Based Bio-telemetry Receiver, A Speech Processing System, An Image Processing System.	<b>05</b>

**Note:** 1. Tutorials based on the programming for basic operations, implementation of DSP algorithms, interfacing and applications of DSP processor using Mentor DSP, TMS Boards.  
2. Group of 3 to 4 student will submit report and will give presentation on recent and relevant applications in signal processing

**Text Books**

1. "Digital Signal Processing", Avtar Singh and S. Srinivasan, Thomson Learning, 2004.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

**Reference Books**

1. Digital Signal Processing: A practical approach, Ifeachor E. C., Jervis B. W Pearson Education, PHI/ 2002
2. "Digital Signal Processors", B Venkataramani and M Bhaskar TMH, 2002
3. "Architectures for Digital Signal Processing", Peter Pirsch John Wiley, 2007
4. Digital Signal Processing – Jonatham Stein, John Wiley, 2005
5. TMS320C50, TMS320C54XX, TMS320C6713 data books.

**Useful Links**

1. <http://www.ti.com/product/TMS320C6713/technicaldocuments>
2. <http://www.ti.com/tool/tmdsdsk6713>

## Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	1	-	-	1	-	-	-	-	-	-	-	2	2	-
CO 2	2	-	2	-	2	-	-	-	-	-	-	-	-	1	2
CO 3	3	1	2	-	-	-	-	-	-	-	-	-	-	2	2
CO 4	3	2	2	1	2	-	-	-	-	-	-	-	-	2	1
CO 5	2	2	2	1	2	-	-	-	-	-	-	-	2	2	1
CO 6	2	2	2	1	2	-	-	-	2	2	-	-	2	2	1
Total	15	8	10	3	9	0	0	0	2	2	0	0	6	11	7
Avg.	2.5	1.6	2	1	1.8	0	0	0	2	2	0	0	2	1.833	1.4
%	83.33	53.33	66.67	33.33	60	0	0	0	66.67	66.67	0	0	66.67	61.1	46.67

## Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	-	-	-	10
Understand	05	-	-	10
Apply	05	05	02	10
Analyze	05	05	02	10
Evaluate	-	05	03	10
Create	-	-	03	10
TOTAL	15	15	10	60

**Government College of Engineering, Karad**

**Final Year (Semester – VIII) B. Tech. Electronics and Telecommunication**

**EX2823: Cloud Computing**

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	CT – 1	15
Tutorials	01 Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Illustrate the appropriate cloud services for a given application.	L2
2.	Compare various cloud architectures.	L4
3.	Evaluate infrastructure, software, and platform as services.	L5
4.	Analyze security services for cloud computing.	L4
5.	Evaluate practical case studies for cloud computing.	L5
6.	Inspect standard in cloud services management.	L4

**Course Contents**

**Hours**

<b>Unit 1</b>	<b>Introduction to cloud computing</b> Defining Cloud computing, Characteristics, Components, deployment model, service model, Applications, Benefits of cloud computing, Limitations of cloud computing. Grid Computing, Grid vs Cloud Computing.	<b>04</b>
<b>Unit 2</b>	<b>Cloud architecture, Services and Applications</b> Exploring cloud computing stack – Compos ability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Defining Infrastructure as a Service (IaaS), Defining Software as a Service (SaaS), Defining Platform as a Service (PaaS), Defining Identity as a Service (IDaaS), Defining Compliance as a Service (CaaS).	<b>05</b>
<b>Unit 3</b>	<b>Cloud Infrastructure and Virtualization</b> Hardware and Infrastructure – Clients, Security, Network and Services., use of Virtualization technology, Load Balancing and Virtualization, virtualization benefits, Hypervisors, porting application, defining cloud capacity by defining baselines and Metrics.	<b>05</b>
<b>Unit 4</b>	<b>Exploring cloud services</b> Software as a Service – Overview, advantages, limits, virtualization benefits, examples. Platform as a Service – overview, advantages and functionalities, PaaS application frameworks – Drupal, Long Jump. <b>Case study</b> – Google Apps and Web Services, Azure web services, Amazon web services(AWS)	<b>05</b>
<b>Unit 5</b>	<b>Cloud Administration and Security Management</b> Management responsibilities, lifecycle management, cloud management products, Cloud management standards. Cloud security, data security, Identity and presence protocol standards, Availability management in SaaS, IaaS, PaaS, Access Control, Security Vulnerability, Patch and Configuration Management, Security as a Service of cloud, Future of Security in Cloud computing.	<b>05</b>
<b>Unit 6</b>	<b>Cloud Simulators</b> CloudSim and GreenCloud, Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture, Understanding Working platform for CloudSim, Introduction toGreenCloud	<b>04</b>

**Text Books**

1.	Barrie Sosinsky, “Cloud Computing Bible”, Wiley India Edition.
2.	Anthony Velte, Toby Velte, Robert Elsenpeter, “Cloud Computing – A Practical Approach”, Tata McGraw-Hill Edition.

**Reference Books**

1.	John W. Rittinghouse, James F. Ransome, “cloud computing: implementation management and security” CRC Press.
2.	Gautam Shroff, “Enterprise Cloud Computing: Technology, Architecture, Applications”, Cambridge University Press.
3.	Christian Baun, Marcel Kunze, Jens Nimis, Stefan Tai, “Cloud Computing: Web-Based Dynamic IT Services”, Springer.
<b>Useful Links</b>	
1.	<a href="https://aws.amazon.com/training/">https://aws.amazon.com/training/</a>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	P O 3	P O 4	PO 5	PO 6	P O 7	P O 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO 1	2	2	2	-	-								2	1	-
CO2	2	1	-	1	-								2	-	-
CO 3	1	-	1	-	1								1	-	-
CO 4	2	-	2	1	-								1	-	1
CO 5	2	1	-	-	1								2	1	-
CO 6	2	-	2	-	-								1	-	-
Total	11	4	7	2	2	-	-	-	-	-	-	-	9	2	1
Avg	1.83	1.33	1.75	1	1	-	-	-	-	-	-	-	1.5	1	1
%	60.9	44.3	58.3	33.3	33.3	-	-	-	-	-	-	-	49.9	33.3	33.3

### Assessment Pattern (with revised Bloom’s Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
<b>Remember</b>				<b>5</b>
<b>Understand</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>25</b>
<b>Apply</b>	<b>5</b>	<b>5</b>	<b>5</b>	<b>10</b>
<b>Analyze</b>	<b>5</b>			<b>10</b>
<b>Evaluate</b>		<b>5</b>		<b>10</b>
<b>Create</b>				
<b>TOTAL</b>	<b>15</b>	<b>15</b>	<b>10</b>	<b>60</b>

<b>Government College of Engineering, Karad</b>				
<b>Final Year (Semester – VIII) B. Tech. Electronics and Telecommunication</b>				
<b>EX2833: Real Time System Design and Applications</b>				
<b>Teaching Scheme</b>			<b>Examination Scheme</b>	
Lectures	02Hrs/week		CT – 1	15
Tutorials	01Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			<b>Duration of ESE</b>	<b>02 Hrs 30 Min</b>
<b>Course Outcomes (CO)</b>				
Student will be able to				
1.	Classify real time system.			L2
2.	Choose priority based scheduling as per application.			L3
3.	Survey of real time database and communication.			L4
4.	Demonstrate hardware interface in real time systems.			L2
5.	Develop application in real time system design using recent RTOS.			L5
6.	Create reports and presentation on real time system with different case studies.			L5
<b>Course Contents</b>				<b>Hours</b>
<b>Unit 1</b>	<b>Introduction to Real Time Systems :</b> kernels, Types of kernels, Kernel Architecture Overview, Kernel Functional Overview, Address Spaces and Privilege Levels, Memory Management, System Calls, Device Driver, libraries. Real time Systems Concepts, Events and Determinism, CPU Utilization, Real-Time System Design Issues, Applications, Hard Versus Soft Real-Time Systems, A Reference Model of Real-Time Systems			<b>06</b>
<b>Unit 2</b>	<b>Priority driven scheduling of Periodic jobs:</b> Static assumptions, Fixed priority versus Dynamic priority algorithms, Schedulability test for Fixed priority tasks with- short response times and arbitrary response times. Commonly used approaches for real time scheduling: uni-processor and multiprocessor scheduling algorithms.			<b>06</b>
<b>Unit 3</b>	<b>Realtime Databases and Communication:</b> Main Memory Databases, Disk type Database, Transaction scheduling, Concurrency control issues, Databases for Hard Real Time Systems. Communications media, Network Topologies Protocols, Fault Tolerant Routing. Fault Tolerance Techniques.			<b>04</b>
<b>Unit 4</b>	<b>Real time hardware interfaces:</b> Raspberry Pi, Beaglebone, Edison , Porting real time operating System on boards and its Programming using RTOSes, Micro/OS-II, Vx works, Linux driver programming ,operating system security SELinux.			<b>06</b>
<b>Unit 5</b>	<b>Application and Case Studies:</b> Linux POSIX system, RTLinux/ RTAI, Vxworks, Digital camera, an Automatic Chocolate Vending Machine, an Adaptive Cruise Control (ACC) system in Car. Mobile Phone software for Key input.			<b>06</b>
<b>Unit 6</b>	<b>Porting of RTOS and interfacing:</b> Porting of RTOS on hardware platform, Real time Interfaces of camera, sensors, actuators using parallel ,serial and USB port., Implementation of case studies on given hardware platform.			<b>04</b>
<b>Note</b>	Tutorials will be based on RTOS case studies , applications, preparing and presenting reports.			
<b>Text Books</b>				
1.	Krishna.C.M, “Real Time Systems”, TMH, India, 3rd Reprint 2010.			
2.	Jane W.S.Liu, Real Time Systems, Pearson Education, Asia, 2006			
3.	Raj kamal, “Embedded system Architecture, programming and design”, 3 rd edition 2017, McGraw -Hill,			
<b>Reference Books</b>				
1.	Lapante P. A. , Real Time Systems Design and Analysis, 4th Edition, Wiley & Sons, Incorporated, John			
2.	Hermann Kopetz, “Real-Time Systems: Design Principles for Distributed Embedded Applications (Real-Time Systems Series)”, Springer, 2 <sup>nd</sup> Edition			
3.	Abraham Silberschatz, Peter B. Galvin, Greg Gagne, “Operating System Concepts”, 8th Ed., John Wiley, 2008.			
<b>Useful Links</b>				
1.	IEEE Technical Committee on Real-time systems			
2.	Ada'95 Reference Manual			

## Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	2	2	1	1								2		1
CO2	3	1	2	1	1								2		1
CO 3	2	1			1								2	1	
CO 4	2	1	2		1								2		2
CO 5	2	1	2	1									2		1
CO 6	2	2	2		1				2	2		1	2		1
Total	14	8	10	3	5	-	-	-	2	2	-	1	12	1	6
AVG	2.33	1.33	2	1	1	-	-	-	2	2	-	1	2	1	1.2
%	77.65	44.32	66.66	33.33	33.33	-	-	-	66.66	66.66	-	33.33	66.66	33.33	39.99

## Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				10
Understand	05			10
Apply	05	05		10
Analyze	05	05	05	10
Evaluate		05	05	10
Create				10
TOTAL	15	15	10	60



**Government College of Engineering, Karad**

**Final Year (Semester – VIII) B. Tech. Electronics and Telecommunication**

**EX2843: Agro Instrumentation**

Teaching Scheme		Examination Scheme	
Lectures	02Hrs/week	CT – 1	15
Tutorials	01Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Illustrate Environmental issues.	L2
2.	Utilize modern tools & techniques in agro industry.	L3
3.	Provide Solution for productivity enhancement and paste control.	L5
4.	Identifywaste management & dispose control system.	L3
5.	Develop irrigation management & rain harvesting system.	L3
6.	Create Report and presentation on recent trends and development in agro industry through visits.	L6

**Course Contents**

**Hours**

<b>Unit 1</b>	<b>Role of engineering in agricultural sector</b> Professional responsibilities and professional ethics, engineering divisions in agricultural sector, Environmental issues, various government policies for research and development under agricultural engineering for productivity enhancement	<b>03</b>
<b>Unit 2</b>	<b>Sensor technologyforagriculture</b> Measurement of pH, Electrical conductivity, gas analysis, humidity, leaf area, chlorophyll content, and soil moisture & temperature.	<b>05</b>
<b>Unit 3</b>	<b>PrecisionFarming</b> An introduction to precision farming. GIS/GPS positioning system for precision farming, Yield monitoring and mapping, soil sampling and analysis. Computers and Geographic information systems. Precision farming- Issues and conditions. Role of electronics in farm machinery for precision farming.	<b>07</b>
<b>Unit 4</b>	<b>Measurement and Instrumentation in Agriculture</b> Instrument for crop monitoring – moisture measurement – capacitive, infrared reflectance and resistance. Monitoring soil and weather – measurement of soil properties and meteorological parameters – irrigation control systems. Instruments for crop establishment monitoring. Crop spraying – selective crop spraying – flow control. Yield monitoring. Technology for precision farming. Instruments for protected cultivation – green house environment control – transducers and control system. Instruments and systems for crop handling processing and storage. ,	<b>07</b>
<b>Unit 5</b>	<b>Advance Applications of Agriculture 1</b> Greenhouse: History of modeling and control of Greenhouse, Identification of control and manipulation variables for Greenhouse. Crop Preservation : Importance of Preservation of various commodities and parts of plants, Drying process for preservation, Variable identification for drying process, Electronic control system for grape drying process, Sorting machine, Irrigation System,	<b>03</b>
<b>Unit 6</b>	<b>Advance Applications of Agriculture 2</b> Agricultural Drones & Robotics, Artificial Intelligence (AI) based farming, Rain prediction system, Waste management system, agricultural water pump monitoring system(auto switch), renewable energy sources, Greenhouse system. <b>Note-Each application should be elaborated with block schematic And Expansion.</b>	<b>03</b>
<b>Note</b>	Student should visit any hi tech Farm or visit modern agree instrument manufacturing industry and submit report on that. Tutorial will be based on different applications in agricultural sector.	

**Text Books**

1.	Curtis Johnson, —Process ControlInstrumentation Technology; 8th Edition, PearsonEducation
2.	Kuhar, John. E. The precision farming guide foragriculturalist.

**Reference Books**

1.	De Mess M. N. Fundamental of Geographic Information System. John Willy & sons, NewYork, Datta S.K.
2.	K. KrishnaSwamy, —ProcessControl;NewAgeInternational Publisher.

3.	Lori J. Dhabalt, USManual of Soil & Water conservation Engineering. Oxford & IBH Co.Sigma & Jagmohan,
4.	Stuart A. Boyer, SCADA supervisory control and data acquisition, ISAPublication
<b>Useful Links</b>	
1.	<a href="https://www.youtube.com/watch?v=iUNNec3U_Pc">https://www.youtube.com/watch?v=iUNNec3U_Pc</a>
2.	<a href="https://www.youtube.com/watch?v=3ULkpgyDnE0">https://www.youtube.com/watch?v=3ULkpgyDnE0</a>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO7	PO8	PO 9	PO 10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	1	1	1	-	2	2	2				2			2
CO2	2	2	2	2	3	1	2	2				2			2
CO 3	2	2	2	2	2	1	2	2				2			2
CO 4	1	2	2	2	1	2	2	2				2			2
CO 5	1	2	2	2	1	2	2	2				2			2
CO 6	2	2	2	2	2	2	2	2	2	2		2			2
Total	9	11	11	11	9	10	12	12	2	2		12			12
Avg	1.5	1.83	1.83	1.83	1.8	1.66	2	2	2	2		2			2
%	50	61.11	61.11	61.11	60	55.55	66.66	66.66	66.66	66.66		66.66			66.66

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				10
Understand	05			10
Apply	05	05	03	10
Analyze	05	05	02	10
Evaluate		05	02	10
Create			03	10
TOTAL	15	15	10	60

**Government College of Engineering, Karad**

**Final Year (Semester – VIII) B. Tech. Electronics and Telecommunication**

**EX2853: Cyber Security**

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	CT – 1	15
Tutorials	01 Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Identify the cyber threats	L3
2.	Explain security challenges in Mobile and Wireless Devices	L2
3.	Analyze tools and methods used in Cyber crime	L4
4.	Make use of information and data to serve as digital evidence	L3
5.	Discuss organizational implications of cybercrime	L6
6.	Create a report and presentation on case study in Cyber Security	L6

**Course Contents**

**Hours**

<b>Unit 1</b>	<b>Introduction:</b> Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrimes, Cyber offenses, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets : The Fuel for Cybercrime, Attack Vector	<b>04</b>
<b>Unit 2</b>	<b>Mobile and Wireless Devices:</b> Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era.	<b>06</b>
<b>Unit 3</b>	<b>Tools and Methods Used in Cybercrime:</b> Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft, Phishing, Identity Theft (ID Theft)	<b>05</b>
<b>Unit 4</b>	<b>Computer Forensics:</b> Digital Forensics Science, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Setting up a Computer Forensics Laboratory: Understanding the Requirements, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics	<b>06</b>
<b>Unit 5</b>	<b>Intrusion Detection and Prevention System:</b> Intruders, Intrusion Detection, Analysis Approaches, Host-Based Intrusion Detection, Network-Based Intrusion Detection, Distributed or Hybrid Intrusion Detection, Intrusion Detection Exchange Format, Honeypots, Example System: Snort The Need for Firewalls, Firewall Characteristics and Access Policy, Types of Firewalls, Firewall Basing Firewall Location and Configurations, Intrusion Prevention Systems, Example: Unified Threat Management Products.	<b>07</b>
<b>Unit 6</b>	<b>Kali Linux:</b> Linux Command Line - The Linux Filesystem - User Privileges - File Permissions - Editing Files - Data Manipulation - Managing Installed Packages - Processes and Services - Managing Networking - Netcat: The Swiss Army Knife of TCP/IP Connections - Automating Tasks with cron Jobs	<b>04</b>
<b>Note</b>	<b>Tutorials</b> - Latest Study Topics on Cyber Crime and Investigations - Recent Cyber Crime Cases – Recent Digital Forensics Cases – Bridging the Gaps in Cyber Crime Investigations between the cyber security stakeholders.	

**Text Books**

1.	Nina Godbole, Sunit Belapure, “Cyber Security”, Wiley India, New Delhi
2.	Nina Godbole, “Information Systems Security”, Wiley India, New Delhi
3.	W.A.Coklin, G.White, Principles of Computer Security: Fourth Edition, McGrawHill, 2016

**Reference Books**

1.	William Stallings, Cryptography and Network Security Principles and Practices, Seventh Edition, Pearson
2.	Achyut S. Godbole, Web Technologies: TCP/IP, Web/Java Programming, and Cloud Computing, Tata

McGraw-Hill Education, 2013			
<b>Useful Links</b>			
1.	<a href="https://www.newhorizons.com/promotions/cybersecurity-ebooks">https://www.newhorizons.com/promotions/cybersecurity-ebooks</a>		
2.	<a href="https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks#syllabus">https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks#syllabus</a>		
3.	<a href="https://www.udemy.com/course/cyber-security-kali-linux-course/">https://www.udemy.com/course/cyber-security-kali-linux-course/</a>		
4.	<a href="https://www.udemy.com/course/kali-linux-tutorial-for-beginners-en/">https://www.udemy.com/course/kali-linux-tutorial-for-beginners-en/</a>		

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	2	-	2	1	2	-	-	-	-	-	2	-	-	-
CO2	1	2	-	2	-	2	-	-	-	-	-	2	-	-	-
CO 3	2	2	1	2	2	-	1	-	-	-	-	-	-	-	-
CO 4	-	-	2	2	2	1	1	-	-	-	-	1	-	-	-
CO 5	-	2	1	2	-	2	-	-	-	3	-	1	-	-	-
CO 6	-	2	1	2	2	-	-	-	2	2	-	2	-	-	-
AVG	1.33	2	1.25	2	1.75	1.75	1	-	2	2.5	-	1.6	-	-	-
%	44.33	66.66	41.66	66.66	58.33	58.33	33.33	-	66.66	83.33	-	53.33	-	-	-

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember				
Understand	5			10
Apply	5	5	2	15
Analyze	5	5	2	15
Evaluate		5	2	10
Create			4	10
TOTAL	15	15	10	60

**Government College of Engineering, Karad**

**Final Year (Semester – VIII) B. Tech. Electronics and Telecommunication**

**EX2863: Computer Vision**

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs./week	CT – 1	15
Tutorials	01 Hrs./week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs. 30 Min

**Course Outcomes (CO)**

Student will be able to

1.	Relate human eye & camera operation.	L2
2.	Analyze digital image processing filter functions	L4
3.	Design vision systems for applications in industrial automation and robotics.	L3
4.	Compare low- and high-level vision.	L2
5.	Utilize the Open-cv or python library functions in computer vision application.	L1
6.	Create the report and presentation of recent trend in computer vision applications	L3

**Course Contents**

	Hours
<b>Unit 1 Vision Systems:</b> Basic Elements of visual perception, structure of human eye, image formation in the eye, pinhole cameras, color cameras, image formation model, imaging components and illumination techniques, picture coding, basic relationship between pixels, Camera-Computer interfaces.	06
<b>Unit 2 Low-Level Vision:</b> Image representation, gray level transformations, Histogram equalization, image subtraction, image averaging, Filters, smoothing spatial filters, sharpening spatial filters, smoothing frequency domain filters, sharpening frequency domain filters, edge detection.	06
<b>Unit 3 Higher – Level Vision:</b> Segmentation, Edge linking and boundary detection, Thresholding, Region-oriented segmentation, the use of motion, Description, Boundary Descriptors, Regional Descriptors, Recognition, Decision-Theoretic methods, structural methods.	06
<b>Unit 4 Robot Vision:</b> Basic introduction to Robotic operating System (ROS), Robotic Assembly Sensors and Intelligent Sensors, visual servo-control, Installing and testing ROS camera Drivers	04
<b>Unit 5 Applications of Vision Systems:</b> Camera Calibration, Stereo Imaging, transforming sensor reading, Mapping Sonar Data, aligning laser scan measurements, Vision and Tracking, Following the road, Iconic image processing, Multiscale image processing, Video Tracking, learning landmarks, Landmark spatiograms, K-means Clustering, EM Clustering, Kalman Filtering.	05
<b>Unit 6</b> Introduction to OpenCV image processing library, open cv command and functions related with image and vision, The OpenCV Python Interface, OpenCV Basics, Processing Video, Tracking, The cv_bridgePackage, Robotic operating System (ROS) to OpenCV, More Examples	05

**Text Books**

1.	K.S.Fu,R.C.Gonzalez,CSG.Lee,—Roboticscontrol, sensing,visionandIntelligence,McGrawHillEducation Pvt. Ltd., 2013.
2.	Damian M Lyons, —Cluster Computing for Robotics and Computer Visionl, World Scientific, Singapore, 2011.

**Reference Books**

1.	Carsten Steger, Markus Ulrich, Christian Wiedemann, —Machine Vision Algorithms andApplications, WILEY- VCH, Weinheim, 2008.
2.	Janaki Raman. P.A., “Robotics and Image Processing”, Tata McGraw-Hill Publication, 1st edition, 1995.
3.	RichardDKlafter,ThomasAChmielewski,MichaelNegin,—RoboticsEngineering:AnIntegratedApproachl,PHI Learning, New Delhi,2009

**Useful Links**

1.	<a href="https://nptel.ac.in/courses/106/105/106105216/">https://nptel.ac.in/courses/106/105/106105216/</a> - I.I.T, Kharagpur
2.	<a href="https://nptel.ac.in/courses/108/103/108103174/">https://nptel.ac.in/courses/108/103/108103174/</a> - I.I.T, Guwahati
3.	<a href="https://onlinecourses.nptel.ac.in/noc19_cs58/preview-">https://onlinecourses.nptel.ac.in/noc19_cs58/preview-</a> I.I.T, Kharagpur
4.	<a href="https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs58/">https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs58/</a> - I.I.T, Kharagpur

## Mapping of COs and POs

PO → CO ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	1	1										2		
CO2	2	2	2	1	1								2		
CO 3	2	1	2	1	1								2		2
CO 4	2												2		
CO 5	3	2	1	1	1								2		2
CO 6	2	2	2	1					2	2		1	2		1
Avg	2.17	1.6	1.6	1	1	0.00	0.00	0.00	2	2	0.00	1	2	0.00	1.67
%	72.22	53.33	53.33	33.33	33.33	0.00	0.00	0.00	66.67	66.67	0.00	33.33	66.67	0.00	55.56

## Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5		3	10
Understand	5	5	2	10
Apply		5	3	20
Analyze	5	5	2	20
Evaluate				
Create				
TOTAL	15	15	10	60

<b>Government College of Engineering, Karad</b>				
<b>Final Year (Semester – VIII) B. Tech. Electronics and Telecommunication Engineering</b>				
<b>EX2804: Robotics Lab</b>				
<b>Laboratory Scheme</b>			<b>Examination Scheme</b>	
Practical	2 Hrs/week		CA	50
Total Credits	1		ESE	50
<b>Course Outcomes (CO)</b>				
Student Will be able to				
1.	Inspect the robot for specific application.			L4
2.	Apply the programming techniques for Robotics system			L3
3.	Develop interfacing with sensor and drive system of robot			L6
4.	Design appropriate robotic systems to accomplish a specific task.			L6
<b>List of Experiment</b>				
<b>Experiment 1</b>	Study the parts and classification of robot			
<b>Experiment 2</b>	Study of degrees of freedom and various robot joints			
<b>Experiment 3</b>	Estimation of accuracy, repeatability and resolution.			
<b>Experiment 4</b>	Verification of Position and orientation with respect to gripper and world coordinate system			
<b>Experiment 5</b>	Set a tool center point.			
<b>Experiment 6</b>	Motion planning of Robotic Arm in straight line path			
<b>Experiment 7</b>	Motion planning of Robotic Arm in circular path			
<b>Experiment 8</b>	Robot programming and simulation for pick and place operation using any robot			
<b>Experiment 9</b>	Robot programming and simulation for Color identification			
<b>Experiment 10</b>	Robot programming and simulation for Shape identification			
<b>Experiment 11</b>	Robot programming and simulation for machining (cutting, welding)			
<b>Experiment 12</b>	Robot programming and simulation for any industrial process (Packaging, Assembly)			
<b>Experiment 13</b>	Robot programming and simulation for multi process			
<b>Experiment 14</b>	Industrial visit and its report on industrial applications of robots			
<b>List of Submission</b>				
1	Total number of Experiments: 8			
2	Total number of sheets: NA			
3	Project/Dissertation Report: 01			
4	Seminar report: NA			
5	Field Visit Report: NA			

## Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	1	1		2										
CO 2	2	3	2	3	2								3		2
CO 3	2	1	3	1									2		1
CO 4	2	2	3	2	2								3		2
<b>Total</b>	8	7	9	6	6	-	-	-	-	-	-	-	8	-	5
<b>AVG</b>	2	1.75	2.25	2	2	-	-	-	-	-	-	-	2.66	-	1.66
<b>%</b>	66.66	58.32	74.99	66.66	66.6	-	-	-	-	-	-	-	88.65	-	55.32

## Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CA	ESE
Remember	5	5
Understand	10	5
Apply	10	5
Analyze	10	10
Evaluate	10	15
Create	5	10
<b>TOTAL</b>	50	50



**Government College of Engineering, Karad**

**Final Year (Semester – VIII) B. Tech. Electronics and Telecommunication Engineering**

**EX2805: Project Work Phase 2(Academic Mode)**

Laboratory Scheme		Examination Scheme	
Practical	16 Hrs./week	CT – 1	50
Total Credits	8	CT – 2	50
		CA	100
		ESE	100

**Course Outcomes (CO)**

Student Will be able to

1.	Analyze societal & environmental needs for finalizing solutions in modern ways.	L4
2.	Propose optimize solutions for complex engineering problem.	L6
3.	Evaluate the project in terms financial feasibility ,power consumption, technical performance, market sustainability, flexibility, etc.	L5
4.	Explain effectively proposed engineering solutions with necessary presentation by entire project team	L5
5.	Create a prototype model of the system & report about the new learning techniques, resources, and modern engineering tools	L6

**Course Contents**

Students should

- List out the material requirement & availability
- Identify optimized components requirement & the correct specification of items used in project
- Identify various tools utilization & availability
- Publish a paper on project work in peer reviewed journals/ conference identified by department (mandatory)
- Make a report in standard format using editing tools ( Microsoft word or latex)
- Check for plagiarism of Project Report & paper to be published by using Turnitin software (up to 10 % allowed, guide will check & certify)
- Attach standard format of Certificate as prescribed by the department. Certificate should be awarded to project team and not to individual student.
- End Semester Examination ESE shall consist of an oral examination based on the report submitted by the candidates and the demonstration of the project functionality.
- End Semester Examination (ESE) will be conducted by a panel of two examiners consisting of preferably the guide working as a senior and other external examiner preferably from Industry or the external Academic institute.

**Evaluation will be based on following criteria:**

- Justification of domain, title & Idea of project & Scope
- Literature review for last 3 Years to do the gap analysis.
- System Modeling, Requirement of Major Components, Software or Flowchart
- Implementation of proposed project work (Roadmap, Methodology/Algorithms, block schematic, Progressive chart, activity chart with deadline time, Finalization of design, etc)
- Innovative idea/Innovative concepts/New Ideas incorporated in the project work
- Cutting edge software ,hardware tools used for the project work
- Percentage of implementation/completion of project work (100% Completion is expected)
- Research publication on project work. (Survey paper, proof of concept, innovative idea of project, implementation of project, etc.)

Note -Hardcopy of project diary should be maintained GroupWise, duly signed by guide where report of every week activity should be mentioned for continuous evaluation during the term. This diary should be presented at the time of End Semester examination

## Mapping of COs and POs

PO → CO ↓	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	1	2	2	2	2	2	3	2	2	2	2	2	2	2	2
CO 2	2	2	3	2	2	-	-	-	1	1	1	1	2	2	2
CO 3	2	2	1	1	1	-	2	-	1	2	3	1	2	2	2
CO 4	2	2	2	2	2	-	-	-	3	3	2	1	2	2	2
CO5	1	1	1	1	1	1	-	-	2	2	1	2	2	2	2
Avg	1.6	1.8	1.8	1.6	1.6	1.5	2.5	2	1.8	2	1.8	1.4	2	2	2
%	53.33	60	60	53.33	53.33	50	83.33	66.67	60	66.67	60	46.67	66.67	66.67	66.67

## Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CA	ESE
Remember	-	-
Understand	20	10
Apply	30	20
Analyze	30	30
Evaluate	20	40
Create	50	50
TOTAL	150	150

**Government College of Engineering, Karad**

**Final Year (Semester – VII) B. Tech. Electronics and Telecommunication Engineering**

**EX2810: Project Work Phase 2 (Industry Mode)**

Laboratory Scheme		Examination Scheme	
Practical	-	CT – 1	50
Total Credits	8	CT – 2	50
		CA	100
		ESE	200

**Course Outcomes (CO)**

Student Will be able to

1.	Analyze societal & environmental needs for finalizing solutions in modern ways.	L4
2.	Propose optimize solutions for complex engineering problem.	L6
3.	Evaluate the project in terms financial feasibility, power consumption, technical performance, market sustainability, flexibility etc.	L5
4.	Explain effectively proposed engineering solutions with necessary presentation by entire project team	L5
5.	Create a prototype model of the system & report about the new learning techniques, resources, and modern engineering tools.	L6

**Course Contents**

Students should

1. List out the material requirement & availability
2. Identify optimized components requirement & the correct specification of items used in project
3. Identify various tools utilization & availability
4. Publish a paper on project work in peer reviewed journals/ conference identified by department (mandatory)
5. Make a report in standard format using editing tools (Microsoft word or latex)
6. Check for plagiarism of Project Report & paper to be published by using Turnitin software (up to 10 % allowed, guide will check & certify)
7. Attach standard format of Certificate as prescribed by the department. Certificate should be awarded to project team and not to individual student.
8. The entire report should be documented as one chapter with details like
  - 1) “Name of Industry with address along with completed training certificate”
  - 2) Area in which Industrial training is completed All Students have to present their reports individually.
  - 3) All students should attach MoU signed with industry.
9. End Semester Examination ESE shall consist of an oral examination based on the report submitted by the candidates and the demonstration of the project functionality.
10. End Semester Examination (ESE) will be conducted by a panel of two examiners consisting of preferably the guide working as a senior and other external examiner preferably from Industry or the external Academic institute.

**Evaluation will be based on following criteria:**

1. Justification of domain, title & Idea of project & Scope
2. Literature review for last 3 Years to do the gap analysis.
3. System Modeling, Requirement of Major Components, Software or Flowchart
4. Implementation of proposed project work (Roadmap, Methodology/Algorithms, block schematic, Progressive chart, activity chart with deadline time, Finalization of design ,etc)
5. Innovative idea/Innovative concepts/New Ideas incorporated in the project work
6. Cutting edge software, hardware tools used for the project work
7. Percentage of implementation/completion of project work (100% Completion is expected)
8. Research publication on project work. (Survey paper, proof of concept, innovative idea of project, implementation of project, etc.)

Note -Note -Hardcopy of project diary should be maintained GroupWise, duly signed by guide where report of every week activity should be mentioned for continuous evaluation during the term. This diary should be presented at the time of End Semester examination

## Mapping of COs and POs

PO → CO ↓	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PO1 1	PO12	PSO1	PSO 2	PSO3
CO 1	1	2	2	2	2	2	3	2	2	2	2	2	2	2	2
CO 2	2	2	3	2	2	-	-	-	1	1	1	1	2	2	2
CO 3	2	2	1	1	1	-	2	-	1	2	3	1	2	2	2
CO 4	2	2	2	2	2	-	-	-	3	3	2	1	2	2	2
CO5	1	1	1	1	1	1	-	-	2	2	1	2	2	2	2
Avg	1.6	1.8	1.8	1.6	1.6	1.5	2.5	2	1.8	2	1.8	1.4	2	2	2
%	53.33	60	60	53.33	53.33	50	83.33	66.67	60	66.67	60	46.67	66.67	66.67	66.67

## Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CA	ESE
Remember	-	-
Understand	20	10
Apply	40	40
Analyze	40	40
Evaluate	40	45
Create	60	65
TOTAL	200	200

<b>Government College of Engineering, Karad</b>				
<b>Final Year (Sem – VII) B. Tech. Electronics &amp; Telecommunication</b>				
<b>Audit Course Lab I: EX2712: Foundations of Data Science and Machine Learning Lab</b>				
<b>Laboratory Scheme:</b>			<b>Examination Scheme:</b>	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
<b>Prerequisite :</b> Mathematics, Basic Programming skills				
<b>Course Outcomes (CO):</b> Students will be able to				
<b>CO1</b>	Analyze and visualize data using statistical methods and tools to extract meaningful insights.			
<b>CO2</b>	Implement and manage efficient data storage, retrieval, and preprocessing for decision-making.			
<b>CO3</b>	Develop and evaluate machine learning models and neural networks to solve complex problems.			
<b>CO4</b>	Utilize cloud computing resources and ensure ethical considerations in the design of AI systems.			
<b>Course Contents</b>				<b>CO</b>
<b>Implementation of following concepts</b>				
<b>Experiment 1</b>	Data visualization effectiveness evaluation with Python and Tableau			<b>CO1</b>
<b>Experiment 2</b>	Real-world dataset exploratory analysis using Python /R			<b>CO1</b>
<b>Experiment 3</b>	Common data cleaning challenges and solutions using Python and SQL			<b>CO2</b>
<b>Experiment 4</b>	Database performance optimization strategies assessment.			<b>CO2</b>
<b>Experiment 5</b>	Machine learning algorithm performance comparison using TensorFlow, PyTorch, and scikit-learn			<b>CO3</b>
<b>Experiment 6</b>	Machine learning model monitoring framework development using TensorFlow Serving and Prometheus			<b>CO3</b>
<b>Experiment 7</b>	Neural network architecture comparison for image classification tasks using TensorFlow and PyTorch with and without Hyperparameter tuning			<b>CO3</b>
<b>Experiment 8</b>	Transfer learning techniques implementation and evaluation			<b>CO3</b>
<b>Experiment 9</b>	Scalability assessment using containerization technologies like Docker and Kubernetes.			<b>CO4</b>
<b>Experiment 10</b>	Serverless architecture implementation and efficiency evaluation.			<b>CO4</b>
<b>Experiment 11</b>	Bias detection experiments using fairness metrics and diverse datasets and Fairness-aware model training techniques exploration			<b>CO4</b>
<b>Experiment 12</b>	Regulatory compliance analysis and strategies development			<b>CO4</b>
<b>List of Submission:</b>				
Minimum No. of Experiments: 10				

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
<b>CO 1</b>	2	3	3	3	3	1	-	-	-	-	-	2	-	2
<b>CO 2</b>	2	2	2	2	3	2	-	-	2	2	2	2	1	-
<b>CO 3</b>	3	3	3	3	3	-	1	2	1	2	3	2	-	1
<b>CO 4</b>	2	3	2	3	3	2	2	2	2	2	1	2	2	-

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

**Assessment Guideline:** Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

\*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

This approach ensures that students gain practical experience and valuable feedback, enhancing their learning without the pressure of formal exams.

<b>Government College of Engineering, Karad</b>				
<b>Final Year (Sem – VII) B. Tech. Electronics &amp; Telecommunication</b>				
<b>Audit Course Lab I: EX2722: AIoT Development Lab</b>				
<b>Laboratory Scheme:</b>			<b>Examination Scheme:</b>	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
<b>Prerequisite :</b> Mathematics, Basic Programming skills				
<b>Course Outcomes (CO):</b> Students will be able to				
<b>CO1</b>	Understand the fundamentals of IoT hardware and software.			
<b>CO2</b>	Develop proficiency in programming and simulating IoT devices.			
<b>CO3</b>	Gain knowledge of artificial intelligence concepts and their integration with IoT systems.			
<b>CO4</b>	Explore the practical applications and implications of IoT technologies in various domains.			
<b>Course Contents</b>				<b>CO</b>
<b>Implementation of following concepts</b>				
<b>Experiment 1</b>	Familiarization with IoT development kits (e.g., Raspberry Pi, Arduino, ESP32)			<b>CO1</b>
<b>Experiment 2</b>	Understanding the components and capabilities of IoT hardware platforms			<b>CO1, CO2</b>
<b>Experiment 3</b>	Exploring different types of sensors (temperature, humidity, motion, light, etc.)			<b>CO2, CO3</b>
<b>Experiment 4</b>	Hands-on exploration of actuators (motors, servos, relays) and their applications in IoT			<b>CO1</b>
<b>Experiment 5</b>	Using IoT Circuit Designing Software to build circuits with drag & drop features			<b>CO4</b>
<b>Experiment 6</b>	Programming IoT devices using Block Designer Software			<b>CO1</b>
<b>Experiment 7</b>	Simulating IoT circuits in a virtual environment			<b>CO2</b>
<b>Experiment 8</b>	Hands-on practice with IoT development boards and sensors			<b>CO4</b>
<b>Experiment 9</b>	Programming AI models using Block Designer Software			<b>CO3</b>
<b>Experiment 10</b>	Implementing Python scripts for data analysis and AI applications			<b>CO2, CO3</b>
<b>Experiment 11</b>	Integrating AI models with IoT devices for smart solutions			<b>CO1</b>
<b>Experiment 12</b>	Overview of Artificial Intelligence (AI) and its applications			<b>CO4</b>
<b>Experiment 13</b>	Introduction to the Internet of Things (IoT) and its significance			<b>CO2</b>
<b>Experiment 14</b>	Understanding the concept of Artificial Intelligence of Things (AIoT)			<b>CO3</b>
<b>Experiment 15</b>	Exploring the role of IoT gateways in bridging mobile devices and IoT networks			<b>CO4</b>
<b>Experiment 16</b>	Techniques for establishing seamless connections between mobile devices and IoT gateways			<b>CO1</b>
<b>Experiment 17</b>	Hands-on exercises demonstrating the setup and configuration of mobile-to-IoT connections			<b>CO4</b>
<b>Experiment 18</b>	Overview of sensor technologies commonly used in IoT applications			<b>CO3</b>
<b>Experiment 19</b>	In-depth exploration of various types of sensors and their academic underpinnings			<b>CO1</b>
<b>Experiment 20</b>	Practical demonstrations showcasing the functionality and applications of sensors in IoT systems			<b>CO4</b>
<b>List of Submission:</b>				
Minimum No. of Experiments: 18				

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
<b>CO 1</b>	2	3	3	2	2	2	-	-	2	2	2	3	2	2
<b>CO 2</b>	2	3	2	2	2	2	-	-	3	2	2	3	2	1
<b>CO 3</b>	2	2	3	2	2	2	-	-	2	2	2	2	-	1
<b>CO 4</b>	2	2	2	3	2	2	1	2	3	2	2	3	2	-

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

**Assessment Guideline:** Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

\*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

This approach ensures that students gain practical experience and valuable feedback, enhancing their learning without the pressure of formal exams.



<b>Government College of Engineering, Karad</b>				
<b>Final Year (Sem – VII) B. Tech. Electronics &amp; Telecommunication</b>				
<b>Audit Course Lab I: EX2732: Immersive Game Development Lab</b>				
<b>Laboratory Scheme:</b>			<b>Examination Scheme:</b>	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
<b>Prerequisite :</b> Mathematics, Basic Programming skills				
<b>Course Outcomes (CO):</b> Students will be able to				
<b>CO1</b>	Apply Unity and 3D content creation basics for virtual environment design.			
<b>CO2</b>	Analyse Unity animations and physics for engaging gameplay.			
<b>CO3</b>	Synthesize UI/UX design and scripting for user-friendly Unity interfaces.			
<b>CO4</b>	Design, optimize, and deploy AR/VR experiences in Unity with audio-visual enhancements.			
<b>Course Contents</b>				<b>CO</b>
<b>Implementation of following concepts</b>				
<b>Experiment 1</b>	<b>Real-time Rendering Comparison</b> <ul style="list-style-type: none"> <li>Understand real-time rendering and compare it with offline rendering.</li> <li>Research and present the concept of real-time rendering,</li> <li>Discuss the importance of optimization in real-time rendering.</li> </ul>			<b>CO1</b>
<b>Experiment 2</b>	<b>Unity Interface Exploration</b> <ul style="list-style-type: none"> <li>Explore Unity's interface and features,</li> <li>Experiment with various tools available in Unity.</li> <li>Create a simple scene and organize objects within it.</li> </ul>			<b>CO1</b>
<b>Experiment 3</b>	<b>Introduction to 3D Modelling</b> <ul style="list-style-type: none"> <li>Learn basics of 3D modelling.</li> <li>Understand fundamental 3D modelling concepts, tools, and techniques.</li> <li>Practice creating basic 3D models using modelling software.</li> </ul>			<b>CO1</b>
<b>Experiment 4</b>	<b>Animation Basics in Unity</b> <ul style="list-style-type: none"> <li>Understand animation concepts and tools in Unity.</li> <li>Learn about key frame animation, skeletal animation, and animation blending.</li> <li>Create simple animations for objects and characters in Unity.</li> </ul>			<b>CO2</b>
<b>Experiment 5</b>	<b>Unity's Physics Engine</b> <ul style="list-style-type: none"> <li>Introduction to Unity's physics engine.</li> <li>Learn about Unity's physics components like Rigid body, Collider, and Physics materials.</li> <li>Implement basic physics interactions in Unity scenes.</li> </ul>			<b>CO2</b>
<b>Experiment 6</b>	<b>UI Design and Scripting</b> <ul style="list-style-type: none"> <li>Learn UI/UX design principles and basic scripting in Unity.</li> <li>Create UI elements using Unity's UI system.</li> <li>Learn basics of C# programming language and Write scripts for UI interactions and applications.</li> </ul>			<b>CO3</b>
<b>Experiment 7</b>	<b>Audio and Visual Effects Implementation</b> <ul style="list-style-type: none"> <li>Add audio assets and visual effects to Unity projects.</li> <li>Implement sound effects, background music, and spatial audio.</li> <li>Incorporate visual effects using Unity's VFX Graph.</li> </ul>			<b>CO3</b>
<b>Experiment 8</b>	<b>Unity Project Optimization</b> <ul style="list-style-type: none"> <li>Learn techniques for optimizing Unity projects.</li> <li>Implement LOD (Level of Detail), batching, and occlusion culling.</li> <li>Optimize performance in Unity projects.</li> </ul>			<b>CO3</b>
<b>Experiment 9</b>	<b>Augmented Reality Setup and Interaction</b> <ul style="list-style-type: none"> <li>Understand AR hardware and develop AR experiences.</li> <li>Set up AR sessions and detect/tracking surfaces.</li> <li>Place virtual objects in the real world and implement interactions.</li> </ul>			<b>CO4</b>

<b>Experiment 10</b>	<b>Virtual Reality Development</b> <ul style="list-style-type: none"> <li>• Develop VR experiences using Unity. –</li> <li>• Configure Unity for Oculus development. –</li> <li>• Develop a VR experience for the Meta Quest platform. - Implement VR interactions like grabbing and teleportation.</li> </ul>	<b>CO4</b>
<b>List of Submission:</b>		
Minimum No. of Experiments: 10		

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	3	1	3	2	3	-	-	1	2	3	3	2	2
CO 2	1	1	3	2	2	1	-	-	3	3	1	1	-	-
CO 3	1	3	1	3	1	3	1	3	1	1	3	3	1	1
CO 4	1	1	3	1	3	3	2	1	3	3	1	1	1	-

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

**Assessment Guideline:** Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

\*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

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<b>Government College of Engineering, Karad</b>			
<b>Final Year (Sem – VII) B. Tech. Electronics &amp; Telecommunication</b>			
<b>Audit Course Lab I : EX2742 : ABAP Programming for SAP HANA Lab</b>			
<b>Laboratory Scheme:</b>		<b>Examination Scheme:</b>	
<b>Practical</b>	4 Hrs/week	<b>ISE</b>	-
<b>Total Credits</b>	Audit Course	<b>ESE</b>	-
<b>Prerequisite :</b> Java Programming			
<b>Course Outcomes (CO):</b> Students will be able to			
<b>CO1</b>	Understand SAP HANA concepts, key technologies, and use of SAP HANA Studio and ADT		
<b>CO2</b>	Identify and address ABAP code performance issues and understand SAP HANA's technical requirements and deployment options		
<b>CO3</b>	Utilize Enhanced Open SQL, Core Data Services (CDS), and develop with SAP HANA Native SQL and ABAP Managed Database Procedures		
<b>CO4</b>	Integrate SAP HANA models into ABAP, transport objects, and optimize reports with Full Text Search.		
<b>Course Contents</b>			<b>CO</b>
<b>Experiment 1</b>	Introduction:-SAP HANA Basics and Technical Concepts, SAP HANA Studio, ABAP and SAP HANA		<b>CO1</b>
<b>Experiment 2</b>	Introducing the ABAP Development Tools (ADT), <ul style="list-style-type: none"> <li>• Taking ABAP to SAP HANA,</li> <li>• SAP HANA as Secondary Database– Access via Open SQL.</li> </ul>		<b>CO1</b>
<b>Experiment 3</b>	Code Checks to Prepare ABAP Code for SAP HANA, <ul style="list-style-type: none"> <li>• Tools to Analyse Potential Performance Issues,</li> <li>• Guided Performance Analysis.</li> </ul>		<b>CO2</b>
<b>Experiment 4</b>	SQL Performance Rules for SAP HANA, <ul style="list-style-type: none"> <li>• Database Independent Code-to-Data</li> <li>• Classical Open SQL and Its Limitations.</li> </ul>		<b>CO2</b>
<b>Experiment 5</b>	Enhanced Open SQL, <ul style="list-style-type: none"> <li>• The Basics of Core Data Services in ABAP,</li> <li>• Associations in Core Data Services,</li> <li>• Outlook: More Interesting Features of CDS.</li> </ul>		<b>CO3</b>
<b>Experiment 6</b>	SAP HANA specific Code-to-Data, <ul style="list-style-type: none"> <li>• The Syntax of SAP HANA Native SQL,</li> <li>• ABAP Managed Database Procedures,</li> <li>• ABAP Managed Database Procedures.</li> </ul>		<b>CO3</b>
<b>Experiment 7</b>	Use of SAP HANA Information Models in ABAP, <ul style="list-style-type: none"> <li>• Advanced Topics,</li> <li>• Transporting SAP HANA Objects with ABAP Transport Requests.</li> </ul>		<b>CO4</b>
<b>Experiment 8</b>	Using SAP HANA Full Text Search, <ul style="list-style-type: none"> <li>• ABAP List Viewer with Integrated Database Access (ALV IDA),</li> <li>• Case Study: Optimize a Report on Flight Customer Revenue</li> </ul>		<b>CO4</b>
<b>Experiment 9</b>	Describing SAP HANA, <ul style="list-style-type: none"> <li>• Understanding the Need for a Modern Digital Platform,</li> <li>• Describing How SAP HANA Powers a Digital Platform,</li> </ul>		<b>CO1</b>
<b>Experiment 10</b>	Key Technologies of SAP HANA, <ul style="list-style-type: none"> <li>• Deploying SAP HANA,</li> <li>• Identifying the Key Roles in an SAP HANA Implementation.</li> </ul>		<b>CO1</b>
<b>Experiment 11</b>	Technical Requirements of SAP HANA, Technical Deployment Options		<b>CO2</b>
<b>Experiment 12</b>	High Availability and Disaster tolerance, SAP HANA Lifecycle Management Tools		<b>CO2</b>
<b>List of Submission:</b>			
Minimum number of Experiments : 10			

## Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	-	-	-	1	-	-	-	1	2	-	1	2	1
CO 2	3	2	-	3	3	-	-	-	3	3	-	1	1	2
CO 3	3	3	3	3	3	1	-	1	2	3	-	1	-	1
CO 4	3	3	3	3	3	1	-	1	3	3	2	1	2	-

1: Slight(Low)

2: Moderate(Medium)

3: Substantial(High)

**Assessment Guideline:** Course coordinator will decide the suitable assessment method for internal evaluation for the course completion

\*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
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<b>Government College of Engineering, Karad</b>				
<b>Final Year (Sem – VII) B. Tech. Electronics &amp; Telecommunication</b>				
<b>Audit Course Lab I: EX2752: EV design and 3D Modelling lab</b>				
<b>Laboratory Scheme:</b>			<b>Examination Scheme:</b>	
<b>Practical</b>	2 Hrs/week		<b>ISE</b>	--
<b>Total Credits</b>	Audit Course		<b>ESE</b>	--
<b>Course Outcomes (CO):</b> Students will be able to				
<b>CO1</b>	Demonstrate various softwares needed for 3D modelling			
<b>CO2</b>	Design 3D model of EV components			
<b>CO3</b>	Design of EV Assembly and integration			
<b>CO4</b>	Create Visualization renders of EV			
<b>Course Contents</b>				<b>CO</b>
<b>Experiment 1</b>	Explore 3D modeling softwares			<b>CO1</b>
<b>Experiment 2</b>	Introduction Solidwork software			<b>CO1</b>
<b>Experiment 3</b>	3D modeling of EV components			<b>CO2</b>
<b>Experiment 4</b>	Drafting of EV components in solidworks			<b>CO2</b>
<b>Experiment 5</b>	Basic sketching techniques need for EV components			<b>CO2</b>
<b>Experiment 6</b>	EV layout design			<b>CO3</b>
<b>Experiment 7</b>	Structure design of EV in solidworks			<b>CO2</b>
<b>Experiment 8</b>	parts design of EV component			<b>CO2</b>
<b>Experiment 9</b>	Surface modeling of EV components			<b>CO2</b>
<b>Experiment 10</b>	Assembly sequencing of EV components.			<b>CO3</b>
<b>Experiment 11</b>	Vehicle integration of EV parts			<b>CO3</b>
<b>Experiment 12</b>	Visualization techniques for 3D data			<b>CO4</b>
<b>List of Submission:</b>				
Minimum No. of Experiments: 10				

### Mapping of COs and POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	1	2	3	1	2	1	2	1	1	2	-	1
CO 2	3	2	1	3	3	2	2	1	1	1	1	2	1	2
CO 3	2	3	3	1	3	1	3	2	2	2	2	3	-	1
CO 4	3	3	3	3	3	1	3	1	2	2	2	3	2	-

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

**Assessment Guideline:** Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

\*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

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- Communication and presentation skills.
- Collaboration and peer review contributions.

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<b>Government College of Engineering, Karad</b>				
<b>Final Year (Sem – VII) B. Tech. Electronics &amp; Telecommunication</b>				
<b>Audit Course Lab I: EX2762: Foundation of Electrical Vehicle Lab</b>				
<b>Laboratory Scheme:</b>			<b>Examination Scheme:</b>	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
<b>Prerequisite :</b> Mathematics, Basic Programming skills				
<b>Course Outcomes (CO):</b> Students will be able to				
<b>CO1</b>	Perform experiments by interfacing sensor with microcontroller			
<b>CO2</b>	Illustrate the MATLAB programming for EV systems			
<b>CO3</b>	Develop and execute the Simulink model for different EV units			
<b>CO4</b>	Design the power supply EV unit on PCB.			
<b>Course Contents</b>				<b>CO</b>
<b>Implementation of following concepts</b>				
<b>Experiment 1</b>	Introduction to booting process of raspberry pi			<b>CO1</b>
<b>Experiment 2</b>	Perform experiment to control the speed of dc motor			<b>CO1</b>
<b>Experiment 3</b>	Interface IR/ PIR sensor with microcontroller			<b>CO1</b>
<b>Experiment 4</b>	Interface ultrasonic sensor with microcontroller and find distance			<b>CO1</b>
<b>Experiment 5</b>	Developing SIMULINK Models for Vehicle Units			<b>CO3</b>
<b>Experiment 6</b>	Programming EV Systems in MATLAB			<b>CO2</b>
<b>Experiment 7</b>	Application of Data Analysis Techniques in EV Electrical system			<b>CO2</b>
<b>Experiment 8</b>	Design a power supply unit and create a PCB design for same.			<b>CO4</b>
<b>Experiment 9</b>	Modelling and simulation of EV powertrain components in MATLAB			<b>CO3</b>
<b>Experiment 10</b>	Analysis of EV powertrain components in ANSYS			<b>CO3</b>
<b>Experiment 11</b>	Battery Management System modelling			<b>CO3</b>
<b>Experiment 12</b>	Modelling of Li-ion battery pack using MATLAB and ANSYS			<b>CO3</b>
<b>List of Submission:</b>				
Minimum No. of Experiments: 10				

### Mapping of COs and POs

PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
→														
CO 1	1	2	3	1	3	-	1	-	2	-	2	2	-	1
CO 2	1	2	3	2	3	-	1	-	2	-	2	2	1	2
CO 3	1	2	3	3	3	-	1	-	2	-	2	2	-	1
CO 4	1	2	3	3	3	-	1	-	2	-	2	2	2	-

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

**Assessment Guideline:** Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

\*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

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<b>Government College of Engineering, Karad</b>				
<b>Final Year (Sem – VII) B. Tech. Electronics &amp; Telecommunication</b>				
<b>Audit Course Lab I: EX2772: Fundamentals of Image Processing Lab</b>				
<b>Laboratory Scheme:</b>			<b>Examination Scheme:</b>	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
<b>Prerequisite :</b>				
<b>Course Outcomes (CO):</b> Students will be able to				
<b>CO1</b>	Understand fundamentals of Image Processing Operations			
<b>CO2</b>	Apply and analyse rendering and visualisation of 2D and 3D images			
<b>CO3</b>	Analysis of various transforms & signals			
<b>CO4</b>	Design and Evaluation of Various Classification, detection and segmentation techniques			
<b>Course Contents</b>				<b>CO</b>
<b>Implementation of following concepts</b>				
<b>Experiment 1</b>	Sampling and Quantization operation using Image processing.			<b>CO1</b>
<b>Experiment 2</b>	Data Augmentation techniques for Computer vision			<b>CO1</b>
<b>Experiment 3</b>	Histogram Analysis for Various medical analysis			<b>CO1</b>
<b>Experiment 4</b>	Apply volume rendering and volume visualizing approaches on 2D/3D Images			<b>CO2</b>
<b>Experiment 5</b>	Visualize and explore 2D images and 3D volumes.			<b>CO2</b>
<b>Experiment 6</b>	Implement multi-resolution techniques on large-scale high-resolution images			<b>CO2</b>
<b>Experiment 7</b>	EEG brain signal analysis using wavelet transform			<b>CO3</b>
<b>Experiment 8</b>	ECG heart signal enhancement			<b>CO3</b>
<b>Experiment 9</b>	Brain Tumor detection and classification			<b>CO3</b>
<b>Experiment 10</b>	Fast Bilateral Filter – To eliminate the noise and smoothen the medical image			<b>CO4</b>
<b>Experiment 11</b>	CLAHE – To improve the contrast of the medical image			<b>CO4</b>
<b>Experiment 12</b>	Convolutional Neural Network (CNN) – To segment the tumor part			<b>CO4</b>
<b>List of Submission:</b>				
Minimum No. of Experiments:10				

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
<b>CO 1</b>	1	2	3	1	3	-	1	-	2	-	2	2	2	1
<b>CO 2</b>	1	2	3	2	3	-	1	-	2	-	2	2	1	2
<b>CO 3</b>	1	2	3	3	3	-	1	-	2	-	2	2	-	1
<b>CO 4</b>	1	2	3	3	3	-	1	-	2	-	2	2	1	1

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

**Assessment Guideline:** Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

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<b>Government College of Engineering, Karad</b>				
<b>Final Year (Sem – VIII) B. Tech. Electronics &amp; Telecommunication</b>				
<b>Audit Course Lab II: EX2816: Advanced AI Techniques and Applications Lab</b>				
<b>Laboratory Scheme:</b>			<b>Examination Scheme:</b>	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
<b>Prerequisite :</b> Mathematics, Basic Programming skills				
<b>Course Outcomes (CO):</b> Students will be able to				
<b>CO1</b>	Apply advanced techniques in NLP and Computer Vision to analyse and process diverse data types.			
<b>CO2</b>	Develop AI solutions for solving complex decision-making problems in dynamic environment.			
<b>CO3</b>	Implement industry-specific AI solutions ensuring ethical considerations and regulatory standards.			
<b>CO4</b>	Utilize advanced ML techniques for time series forecasting and interpretability of AI models through explainable AI methods.			
<b>Course Contents</b>				<b>CO</b>
<b>Implementation of following concepts</b>				
<b>Experiment 1</b>	<b>Advanced NLP Experiment</b> <ul style="list-style-type: none"> <li>Build and evaluate a text classification model using advanced NLP techniques.</li> <li>Utilize transformers and pre-trained models from Hugging Face.</li> </ul>			<b>CO1</b>
<b>Experiment 2</b>	<b>Image Classification with CNNs</b> <ul style="list-style-type: none"> <li>Design and train a convolutional neural network (CNN) for image classification.</li> <li>Experiment with data augmentation techniques to improve model performance.</li> </ul>			<b>CO1</b>
<b>Experiment 3</b>	<b>Object Detection and Segmentation</b> <ul style="list-style-type: none"> <li>Implement object detection algorithms (e.g., YOLO, Faster R-CNN).</li> <li>Perform image segmentation using models like U-Net or Mask R-CNN.</li> </ul>			<b>CO1</b>
<b>Experiment 4</b>	<b>Reinforcement Learning Experiment</b> <ul style="list-style-type: none"> <li>Develop and train a reinforcement learning agent using OpenAI Gym.</li> <li>Experiment with different RL algorithms like Q-learning or policy gradients.</li> </ul>			<b>CO2</b>
<b>Experiment 5</b>	<b>Business Process Automation (BPA)</b> <ul style="list-style-type: none"> <li>Automate a business process using robotic process automation (RPA) tools.</li> <li>Integrate machine learning models for intelligent decision-making in workflows.</li> </ul>			<b>CO2</b>
<b>Experiment 6</b>	<b>Industry-Specific AI Solutions</b> <ul style="list-style-type: none"> <li>Develop a predictive maintenance model for manufacturing.</li> <li>Implement a fraud detection system for financial transactions.</li> </ul>			<b>CO3</b>
<b>Experiment 7</b>	<b>Cutting-Edge AI Research Experiment</b> <ul style="list-style-type: none"> <li>Conduct an experiment in a cutting-edge AI research area (e.g., GANs, BERT).</li> <li>Analyze and document the research findings and their implications.</li> </ul>			<b>CO3</b>
<b>Experiment 8</b>	<b>Scalable Machine Learning on Cloud Platforms</b> <ul style="list-style-type: none"> <li>Implement a distributed machine learning training pipeline on a cloud platform.</li> <li>Utilize containerization and orchestration tools like Docker and Kubernetes.</li> </ul>			<b>CO2</b>
<b>Experiment 9</b>	<b>Advanced Model Deployment and Monitoring</b> <ul style="list-style-type: none"> <li>Deploy a machine learning model in a production environment.</li> <li>Set up monitoring tools to track model performance and detect anomalies.</li> </ul>			<b>CO2</b>
<b>Experiment 10</b>	<b>Ethics and Fairness in AI Applications</b> <ul style="list-style-type: none"> <li>Evaluate an AI application for ethical considerations and fairness.</li> <li>Propose and implement measures to address identified ethical concerns.</li> </ul>			<b>CO3</b>
<b>Experiment 11</b>	<b>Time Series Forecasting with Deep Learning</b> <ul style="list-style-type: none"> <li>Develop a deep learning model for time series forecasting (e.g., using LSTM or GRU).</li> <li>Compare the performance with traditional time series models.</li> </ul>			<b>CO4</b>
<b>Experiment 12</b>	<b>Explainable AI (XAI)</b> <ul style="list-style-type: none"> <li>Implement explainability techniques (e.g., SHAP, LIME) for a complex model.</li> <li>Analyze and interpret the model's predictions to ensure transparency and trustworthiness.</li> </ul>			<b>CO4</b>



<b>List of Submission:</b>	
Minimum No. of Experiments: 10	

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	3	3	3	3	1	-	-	-	-	-	2	2	1
CO 2	2	2	2	2	3	2	-	-	2	2	2	2	1	2
CO 3	3	3	3	3	3	-	1	2	1	2	3	2	-	2
CO 4	2	3	2	3	3	2	2	2	2	2	1	2	1	1

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

**Assessment Guideline:** Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

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<b>Government College of Engineering, Karad</b>				
<b>Final Year (Sem – VIII) B. Tech. Electronics &amp; Telecommunication</b>				
<b>Audit Course Lab II: EX2826: Advance AI and IoT Integration Lab</b>				
<b>Laboratory Scheme:</b>			<b>Examination Scheme:</b>	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
<b>Prerequisite :</b> Mathematics, Basic Programming skills				
<b>Course Outcomes (CO):</b> Students will be able to				
<b>CO1</b>	Understanding AIoT Foundations.			
<b>CO2</b>	Apply Hands-on Implementation Skills.			
<b>CO3</b>	Analysis of Sensor Technologies.			
<b>CO4</b>	Design and deploy Innovative Solution.			
<b>Course Contents</b>				<b>CO</b>
<b>Implementation of following concepts</b>				
Experiment 1	Explore various AI applications across industries.			<b>CO1</b>
Experiment 2	Study the significance of IoT in the modern interconnected world.			<b>CO1</b>
Experiment 3	Understand the concept of AIoT and its potential impact.			<b>CO1</b>
Experiment 4	Explore the role of IoT gateways in bridging mobile devices and IoT networks.			<b>CO1</b>
Experiment 5	Perform hands-on exercises for setting up and configuring mobile-to-IoT connections.			<b>CO1</b>
Experiment 6	Conduct a comprehensive overview of sensor technologies used in IoT.			<b>CO3</b>
Experiment 7	Perform an in-depth exploration of various types of sensors and their academic underpinnings.			<b>CO3</b>
Experiment 8	Engage in practical demonstrations and experiments showcasing sensor functionality and applications in IoT systems.			<b>CO3</b>
Experiment 9	Develop a smart traffic signal system for colorblind individuals using AIoT technologies.			<b>CO2</b>
Experiment 10	Implement an AIoT-based plant health analysis system.			<b>CO2</b>
Experiment 11	Create a smart door access control system using AIoT technologies.			<b>CO2</b>
Experiment 12	Design and implement a weather forecasting system using AIoT technologies.			<b>CO2</b>
Experiment 13	Integrate real-time weather data from sensors with AI algorithms for accurate predictions.			<b>CO2</b>
Experiment 14	Engage in hands-on exercises for building, testing, and refining weather forecasting systems.			<b>CO2</b>
Experiment 15	Develop and deploy smart solutions utilizing AIoT principles.			<b>CO2</b>
Experiment 16	Study case studies and real-world examples of successful smart solutions in various domains.			<b>CO4</b>
Experiment 17	Participate in project-based learning to conceptualize, design, and implement AIoT solutions.			<b>CO4</b>
<b>List of Submission:</b>				
Minimum No. of Experiments: 14				

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
<b>CO 1</b>	3	3	2	2	2	-	-	-	-	2	-	2	2	1
<b>CO 2</b>	3	2	2	2	2	1	-	-	3	2	1	2	1	2
<b>CO 3</b>	2	2	3	2	2	-	1	1	3	2	-	2	1	1
<b>CO 4</b>	2	2	2	3	2	1	1	1	2	2	2	2	2	-

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

**Assessment Guideline:** Course coordinator will decide the suitable assessment method for internal evaluation

for the course completion

\*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
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<b>Government College of Engineering, Karad</b>			
<b>Final Year (Sem – VIII) B. Tech. Electronics &amp; Telecommunication</b>			
<b>Audit Course Lab II: EX2836:Advanced ARVR Techniques and Applications Lab</b>			
<b>Laboratory Scheme:</b>		<b>Examination Scheme:</b>	
Practical	04 Hrs/week	ISE	-
Total Credits	Audit Course	ESE	-
<b>Prerequisite :</b> Mathematics, Basic Programming skills			
<b>Course Outcomes (CO):</b> Students will be able to			
<b>CO1</b>	Analyse the Evolution and Applications of Virtual Production Technique		
<b>CO2</b>	Apply Proficiency in Unity Game Engine for Virtual Production		
<b>CO3</b>	Evaluate Lighting Techniques and Design Principles for Virtual Environment		
<b>CO4</b>	Demonstrate Practical Implementation Skills in Virtual Production Projects		
<b>Course Contents</b>			<b>CO</b>
<b>Implementation of following concepts</b>			
Experiment 1	<b>Historical Overview and Evolution of Virtual Production</b> <ul style="list-style-type: none"> <li>• Research and present a historical overview of virtual production techniques.</li> <li>• Analyze the evolution of virtual production in film, television, and other media industries.</li> <li>• Discuss the applications and benefits of virtual production in modern media production.</li> </ul>		<b>CO1</b>
Experiment 2	<b>Green Screen Studio Setup and Operation</b> <ul style="list-style-type: none"> <li>• Explore green screen studios and their setup.</li> <li>• Learn lighting techniques for green screen setups.</li> <li>• Operate a green screen studio to capture footage for virtual production.</li> </ul>		<b>CO3</b>
Experiment 3	<b>Introduction to Unity Game Engine</b> <ul style="list-style-type: none"> <li>• Overview of Unity Game Engine and its features.</li> <li>• Import assets into Unity for virtual production purposes.</li> <li>• Set up virtual environments within Unity for production purposes.</li> </ul>		<b>CO2</b>
Experiment 4	<b>Real-time Rendering Techniques</b> <ul style="list-style-type: none"> <li>• Understand real-time rendering and its importance in virtual production.</li> <li>• Explore techniques for achieving realistic visuals in real-time environments.</li> <li>• Utilize Unity's rendering capabilities for high-quality visual output.</li> </ul>		<b>CO4</b>
Experiment 5	<b>Virtual Set Design Principles</b> <ul style="list-style-type: none"> <li>• Study virtual set design principles and layout.</li> <li>• Design immersive virtual environments for different production needs.</li> <li>• Incorporate props, set dressing, and lighting to enhance realism and aesthetics.</li> </ul>		<b>CO3</b>
Experiment 6	<b>Overview of Virtual Camera Systems</b> <ul style="list-style-type: none"> <li>• Learn about different types of virtual cameras and their functionalities.</li> <li>• Understand the importance of virtual cameras in scene composition and framing.</li> <li>• Explore virtual camera operation within Unity for virtual production.</li> </ul>		<b>CO3</b>
Experiment 7	<b>Lighting Techniques for Virtual Production</b> <ul style="list-style-type: none"> <li>• Study different lighting setups and their effects on virtual production.</li> <li>• Experiment with various lighting techniques in a virtual environment.</li> <li>• Apply appropriate lighting to enhance the realism and aesthetics of virtual scenes.</li> </ul>		<b>CO1</b>
Experiment 8	<b>Asset Importing and Management in Unity</b> <ul style="list-style-type: none"> <li>• Learn best practices for asset importation into Unity.</li> <li>• Organize assets within Unity's project structure.</li> <li>• Understand asset optimization techniques for efficient usage in virtual production.</li> </ul>		<b>CO2</b>
Experiment 9	<b>Creating Virtual Environments in Unity</b> <ul style="list-style-type: none"> <li>• Utilize Unity's terrain and environment tools to build virtual landscapes.</li> <li>• Populate virtual environments with assets and objects.</li> </ul>		<b>CO2</b>

	<ul style="list-style-type: none"> <li>• Apply textures, materials, and effects to enhance the realism of virtual environments.</li> </ul>	
Experiment 10	<b>Practical Application of Virtual Production Techniques</b> <ul style="list-style-type: none"> <li>• Plan and execute a virtual production project using green screen studios and Unity.</li> <li>• Incorporate elements of virtual set design, lighting, and camera composition.</li> <li>• Produce a final virtual production project demonstrating mastery of virtual production techniques.</li> </ul>	<b>CO4</b>
<b>List of Submission:</b>		
Minimum No. of Experiments:10		

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	2	2	2	2	1	-	-	2	1	1	1	-	1
CO 2	3	2	1	2	2	1	-	-	2	1	1	1	1	2
CO 3	2	2	2	2	2	1	-	-	2	1	1	2	-	1
CO 4	2	2	2	3	2	1	-	-	2	1	2	2	2	-

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

**Assessment Guideline:** Course coordinator will decide the suitable assessment method for internal evaluation for the course completion

\*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
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<b>Government College of Engineering, Karad</b>				
<b>Final Year (Sem – VIII) B. Tech. Electronics &amp; Telecommunication</b>				
<b>Audit Course Lab II : EX2846: ABAP programming in Eclipse LAB</b>				
<b>Laboratory Scheme:</b>			<b>Examination Scheme:</b>	
<b>Practical</b>	4 Hrs/week		<b>ISE</b>	-
<b>Total Credits</b>	Audit Course		<b>ESE</b>	-
<b>Prerequisite :</b> Java Programming				
<b>Course Outcomes (CO):</b> Students will be able to				
<b>CO1</b>	Explain the role and functionality of Eclipse in SAP development, including installation and navigation			
<b>CO2</b>	Develop ABAP projects by creating, editing, and debugging repository objects using Eclipse			
<b>CO3</b>	Assess ABAP code performance and quality using static testing tools, ABAP Unit Tests, and the ABAP Profiler within Eclipse			
<b>CO4</b>	Design and implement advanced SAP applications, including Web Dynpro components and ABAP Dictionary Objects, utilizing Eclipse's development environment			
<b>Course Contents</b>				<b>CO</b>
<b>Experiment 1</b>	Introduction to Eclipse, Understanding How SAP Uses Eclipse, Installing Eclipse			<b>CO 1</b>
<b>Experiment 2</b>	Defining an ABAP Project, Organizing Work with the Eclipse Workbench, The ABAP Development Cycle in Eclipse.			<b>CO 2</b>
<b>Experiment 3</b>	Creating Repository Objects, Editing a Repository Object, Debugging ABAP in Eclipse.			<b>CO 2</b>
<b>Experiment 4</b>	Function Groups and Function Modules.			<b>CO 2</b>
<b>Experiment 5</b>	ABAP Dictionary Objects in Eclipse, Working With Data Element, Working With Structures, Modelling Views with ABAP Core Data Services			<b>CO 4</b>
<b>Experiment 6</b>	ABAP Objects and Eclipse, Creating a Global Class, Refactoring			<b>CO 4</b>
<b>Experiment 7</b>	Web Dynpro Development, Creating Web Dynpro Components			<b>CO 4</b>
<b>Experiment 8</b>	Navigating in Eclipse, Searching in Eclipse			<b>CO 1</b>
<b>Experiment 9</b>	Managing Version Control, Identifying Sources of Help and Information			<b>CO 1</b>
<b>Experiment 10</b>	Testing and Analysis, Performing Static Testing with the Syntax Check, Performing Static Testing with the ABAP Test Cockpit.			<b>CO 3</b>
<b>Experiment 11</b>	Performing ABAP Unit Tests, Analysing Performance with the ABAP Profiler.			<b>CO 3</b>
<b>Experiment 12</b>	Eclipse: An Extensible Toolkit, Lesson: Extending Eclipse Functionality with Other SAP Tools.			<b>CO 1</b>
<b>List of Submission:</b>				
Minimum No. of Experiments : 10				

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	2	-	-	2	-	-	-	2	2	-	1	3	1
CO2	3	1	3	2	2	-	-	-	2	2	-	1	2	-
CO3	3	3	3	3	2	-	-	1	3	3	-	1	1	-
CO4	3	2	3	3	3	1	1	1	3	3	1	1	1	2

1: Slight(Low)                      2: Moderate(Medium)                      3: Substantial(High)

**Assessment Guideline:** Course coordinator will decide the suitable assessment method for internal evaluation for the course completion

\*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

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<b>Government College of Engineering, Karad</b>				
<b>Final Year (Sem – VIII) B. Tech. Electronics &amp; Telecommunication</b>				
<b>Audit Course Lab II: EX2856: EV Design Analysis and simulation Lab</b>				
<b>Laboratory Scheme:</b>			<b>Examination Scheme:</b>	
<b>Practical</b>	04 Hrs/week		<b>ISE</b>	--
<b>Total Credits</b>	Audit Course		<b>ESE</b>	--
<b>Prerequisite :</b> Basic Electrical Engineering				
<b>Course Outcomes (CO):</b> Students will be able to				
<b>CO1</b>	Demonstrate various softwares needed for analysis and simulation			
<b>CO2</b>	Design 3D mesh of EV components			
<b>CO3</b>	Analysis 3D data with different simulation softwares			
<b>CO4</b>	Thermal analysis of battery components			
<b>Course Contents</b>				<b>CO</b>
<b>Experiment 1</b>	Introduction to ANSYS			<b>CO1</b>
<b>Experiment 2</b>	Mesh model development using Hyper mesh- 2D			<b>CO1</b>
<b>Experiment 3</b>	Mesh model development using Hyper mesh- 3D			<b>CO2</b>
<b>Experiment 4</b>	Modelling and simulation of EV powertrain components in MATLAB			<b>CO2</b>
<b>Experiment 5</b>	3D modelling of EV powertrain components in ANSYS			<b>CO3</b>
<b>Experiment 6</b>	Simulation of EV powertrain components in ANSYS			<b>CO2</b>
<b>Experiment 7</b>	EV design and structural analysis:			<b>CO2</b>
<b>Experiment 8</b>	FEA analysis for EV engineering with Abaqus			<b>CO2</b>
<b>Experiment 9</b>	Analyze EV dynamic and simulation:			<b>CO1</b>
<b>Experiment 10</b>	CFD analysis for EV			<b>CO3</b>
<b>Experiment 11</b>	Thermal Analysis of Liquid-Cooled Radiator in ANSYS			<b>CO3</b>
<b>Experiment 12</b>	CFD Study of External Cooling Mechanism			<b>CO4</b>
<b>List of Submission:</b>				
Minimum No. of Experiments: 10				

### Mapping of COs and POs:

PO →	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO ↓	1	2	3	4	5	6	7	8	9	10	11			
CO1	2	2	1	2	2	1	2	1	2	1	1	2	2	2
CO2	3	2	1	3	2	2	2	1	1	1	1	2	-	1
CO3	2	3	3	3	3	1	3	2	2	2	2	3	-	-
CO4	3	3	3	3	3	1	3	1	2	2	2	3	1	2

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

**Assessment Guideline:** Course coordinator will decide the suitable assessment method for internal evaluation for the course completion

\*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
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<b>Government College of Engineering, Karad</b>				
<b>Final Year (Sem – VIII) B. Tech. Electronics &amp; Telecommunication</b>				
<b>Audit Course Lab II: EX2866: Advanced Electrical Vehicle Lab</b>				
<b>Laboratory Scheme:</b>			<b>Examination Scheme:</b>	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
<b>Prerequisite :</b> Mathematics, Basic Programming skills				
<b>Course Outcomes (CO):</b> Students will be able to				
<b>CO1</b>	Understand basics of Various convertors & VSI grid integration			
<b>CO2</b>	Analyze Battery controller, cell balancing and SoC control			
<b>CO3</b>	Evaluate speed control operations using Modelling & Simulation			
<b>CO4</b>	Design and Simulate Electric Vehicle and Battery modding			
<b>Course Contents</b>				<b>CO</b>
<b>Implementation of following concepts</b>				
<b>Experiment 1</b>	Simulation of SPWM technique for electric vehicle converter using MATLAB/Simulation.			<b>CO1</b>
<b>Experiment 2</b>	Simulation of three phase VSI for grid integration in EV using MATLAB/Simulation..			<b>CO1</b>
<b>Experiment 3</b>	Design of bidirectional battery circuit using Buck/Boost converter using MATLAB/simulation.			<b>CO1</b>
<b>Experiment 4</b>	Battery controller based on SoC for charging and discharging of battery in EV using MATLAB Simulation.			<b>CO2</b>
<b>Experiment 5</b>	Modelling and Simulation of BMS for passive cell balancing in EV using MATLAB Simulation.			<b>CO2</b>
<b>Experiment 6</b>	SoC control of Lithium Ion battery in MATLAB/ Simulink for EV			<b>CO2</b>
<b>Experiment 7</b>	Simulation of bidirectional operation in Electric Vehicle Charger using single phase model.			<b>Co3</b>
<b>Experiment 8</b>	Modelling and simulation to calculate electric vehicle speed from motor torque.			<b>CO3</b>
<b>Experiment 9</b>	Speed control of electric vehicle using BLDC or PMSM in MATLAB/Simulink.			<b>Co4</b>
<b>Experiment 10</b>	Simulation of electric vehicle using MATLAB/Simulink.			<b>CO4</b>
<b>List of Submission:</b>				
Minimum No. of Experiments :10				

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
<b>CO 1</b>	1	2	3	1	3	-	1	-	2	-	2	2	2	2
<b>CO 2</b>	1	2	3	2	3	-	1	-	2	-	2	2	-	1
<b>CO 3</b>	1	2	3	3	3	-	1	-	2	-	2	2	-	-
<b>CO 4</b>	1	2	3	3	3	-	1	-	2	-	2	2	1	2

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

**Assessment Guideline:** Course coordinator will decide the suitable assessment method for internal evaluation for the course completion

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<b>Government College of Engineering, Karad</b>				
<b>Final Year (Sem – VIII) B. Tech. Electronics &amp; Telecommunication</b>				
<b>Audit Course Lab II: EX2876: Advanced Image Processing Lab</b>				
<b>Laboratory Scheme:</b>			<b>Examination Scheme:</b>	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
<b>Prerequisite :</b> Image Processing				
<b>Course Outcomes (CO):</b> Students will be able to				
<b>CO1</b>	Apply Support Vector Machine for image classification.			
<b>CO2</b>	Articulate image enhancement and restoration techniques			
<b>CO3</b>	Examining image compression Techniques			
<b>CO4</b>	Implementing image segmentation Techniques and Object recognition.			
<b>Course Contents</b>				<b>CO</b>
<b>Implementation of following concepts</b>				
<b>Experiment 1</b>	Support Vector Machine (SVM) – To classify the cancer tumor			<b>CO1</b>
<b>Experiment 2</b>	Automated Segmentation and analysis of skeletal structure images and scans			<b>CO4</b>
<b>Experiment 3</b>	Classifying and locating morphological patterns in an automatic way (on CT and radiographs)			<b>CO1</b>
<b>Experiment 4</b>	Brain tumor and also tissue segmentation			<b>CO4</b>
<b>Experiment 5</b>	Age and also gender classification using Brain MRI			<b>CO2</b>
<b>Experiment 6</b>	Computer aided diagnosis using Mammography			<b>CO2</b>
<b>Experiment 7</b>	Lung cancer detection using medical image processing			<b>CO2</b>
<b>Experiment 8</b>	Kidney stone detection using medical image processing			<b>CO3</b>
<b>Experiment 9</b>	Study of color image compressing using image processing			<b>CO3</b>
<b>Experiment 10</b>	Skin cancer detection			<b>CO4</b>
<b>List of Submission:</b>				
Minimum No. of Experiments:10				

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
<b>CO 1</b>	1	2	3	1	3	-	1	-	2	-	2	2	1	-
<b>CO 2</b>	1	2	3	2	3	-	1	-	2	-	2	2	-	1
<b>CO 3</b>	1	2	3	3	3	-	1	-	2	-	2	2	-	-
<b>CO 4</b>	1	2	3	3	3	-	1	-	2	-	2	2	2	1

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

**Assessment Guideline:** Course coordinator will decide the suitable assessment method for internal evaluation for the course completion

\*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

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- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

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