Shri Vile Parle Kelavani Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Autonomous College Affiliated to the University of Mumbai)

Scheme and detailed syllabus (DJ19)

Second Year B.Tech.

in

Electronics & Telecommunication Engineering

(Semester VI)

Revision: 1 (2019)
With effect from the Academic Year: 2021-2022

1st July, 2021

SEMESTER VI

Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

Scheme for Third Year Undergraduate Program in Electronics & Telecommunication Engineering : Semester V (Autonomous) (Academic Year 2021-2022)

Semester VI

Sr	Course Code	Course	Teaching Scheme				Semester End Examination (A)						Continuous Assessment (B)					Aggregate (A+B)	Credits earned	
			Theory (hrs.)	Practical (hrs.)	Tutorial (hrs.)	Credits	Duration (Hrs)	Theory	Oral	Pract	Oral & Pract	SEE Total (A)	Term Test 1 (TT1)	Term Test 2 (TT2)	Avg (TT1 & TT2)	Term Work Total	CA Total (B)			
1	DJ19ECC601	Digital Communication	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	4
	DJ19ECL601	Digital Communication - Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
2	DJ19ECC602	Radiating Systems	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	4
	DJ19ECL602	Radiating Systems - Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
3	DJ19ECC603	Fundametals of Digital Image Processing	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	4
	DJ19ECL603	Fundametals of Digital Image Processing - Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
4	DJ19ECC604	Computer Networks	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	4
	DJ19ECL604	Computer Networks-Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
5@	DJ19ECEC6011	Advanced VLSI	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	4
	DJ19ECEL6011	Advanced VLSI - Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
	DJ19ECEC6012	Data Compression & Encryption	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ECEL6012	Data Compression & Encryption - Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
	DJ19ECEC6013	Television & Broadcast Technology	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ECEL6013	Television & Broadcast Technology - Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
	DJ19ECEC6014	Artificial Intelligence & Machine Learning	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ECEL6014	Artificial Intelligence & Machine Learning- Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
	DJ19ECEC6015	Robotics	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ECEL6015	Robotics- Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
	DJ19ECEC6016	Advanced Power Electronics	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ECEL6016	Advanced Power Electronics- Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
6	DJ19ECSBL3	Microcontroller & Applications - Laboratory	--	4	--	2	--	--	25	--	--	25	--	--	--	25	25	50	2	2
7	DJ19ILL2	Innovative Product Development- IV	--	2	--	1	--	--	--	--	25	25	--	--	--	25	25	50	1	1
8	DJ19A5	Environmental Studies	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		Total	**16**	**16**	**--**	**23**	**15**	**375**	**150**	**--**	**25**	**550**	**125**	**125**	**125**	**175**	**300**	**850**	**23**	

@ Any 1 Elective Course

Prepared by Checked by **Head of the Department** **Vice Principal** **Principal**

Syllabus for Third Year Electronic and Telecommunication Engineering - Semester VI (Autonomous)
(Academic Year 2021-2022)

<table>
<tr><td colspan="8">Program: Third Year Electronic and Telecommunication Engineering</td><td colspan="3">Semester: VI</td></tr>
<tr><td colspan="8">Course: Digital Communication</td><td colspan="3">Course Code: DJ19ECC601</td></tr>
<tr><td colspan="8">Course: Digital Communication – Laboratory</td><td colspan="3">Course Code: DJ19ECL601</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme (Hours / week)</td><td colspan="7">Evaluation Scheme</td></tr>
<tr><td colspan="3">Semester End Examination Marks (A)</td><td colspan="3">Continuous Assessment Marks (B)</td><td rowspan="2">Total marks (A+ B)</td></tr>
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<tr><td>25</td><td>--</td><td>--</td><td>15</td><td>10</td><td>25</td></tr>
</table>

Pre-requisite:

1. Signals and Systems
2. Random Signal Analysis
3. Analog Communication

Objectives:

1. Learn about theoretical bounds on the rates of digital communication system and represent a digital signal using several modulation methods
2. Draw signal space diagrams, compute spectra of modulated signals and apply redundancy for reliable communication.

Outcomes: On completion of the course, learner will be able to:

1. Encode the messages for the given information source and compare various source coding algorithms for the given information source and to quantify the average information content of it. Also, determine methods to mitigate inter symbol interference in baseband transmission system.
2. Compare and analyze various modulation and Demodulation techniques on the basis of signal space representation, power spectral density, spectral efficiency, probability of error, Matched filter and its probability of error.
3. Apply different error control coding techniques, design encoders for the given specifications.

4. Implement different types of Error control coding's and Digital Modulation and Demodulation with different configuration/components with proper justifications for the results.
5. Gain ability to work in teams to solve complex problems and communicate effective with technical reports /write-ups.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Information theory and source coding:** Block diagram and sub-system description of a digital communication system, measure of information and properties, entropy and it's properties, Source Coding, Shannon's Source Coding Theorem, Shannon-Fano Source Coding, Huffman Source Coding, Differential Entropy, joint and conditional entropy, mutual information and channel capacity, channel coding theorem, channel capacity theorem.	**08**
2	**Baseband Modulation and Transmission:** Discrete PAM signals and it's power spectra, Inter-symbol interference, Nyquist criterion for zero ISI, sinusoidal roll-off filtering, correlative coding, equalizers, and eye pattern.	**04**
3	**Band pass Modulation and Demodulation:** Band pass digital transmitter and receiver model, digital modulation schemes **Generation, detection, signal space diagram, spectrum, bandwidth efficiency, and probability of error analysis of:** Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK)Modulations, Binary Phase Shift Keying (BPSK) Modulation, Quaternary Phase Shift Keying (QPSK), M-ary PSK Modulations, Quadrature Amplitude Modulation (QAM), Minimum Shift Keying (MSK) , Comparison between bandwidth and bit rate, applications of digital modulation schemes	**12**
4	**Optimum Reception of digital Signal:** Baseband Receiver, Probability of Error, Optimum Receiver and filter, Matched filter and its probability of error, Coherent Reception	**06**
5	**Error Control Systems:** Types of error control, error control codes **Linear Block Codes**: vector spaces, vector sub spaces, generator matrix, systematic linear block codes, parity check matrix, syndrome testing, error correction, and decoder implementation **Cyclic codes:** Algebraic structure of cyclic codes, binary cyclic code properties, encoding in systematic form, circuits for dividing polynomials, systematic encoding with shift register and	**12**

	error detection. **Convolution Codes:** Time domain and transform domain approach, graphical representation, code tree, trellis, state diagram, decoding methods, maximum likelihood decoding, and free distance	

List of Laboratory Experiments: (minimum eight)

1. Entropy and Mutual Information
2. Source Coding Algorithms (Huffman coding)
3. Linear block codes (Error detection and correction)
4. Cyclic codes (comparison of performance of coded and uncoded system)
5. Convolutional Encoding - Time domain approach
6. ASK, FSK and PSK
7. Generation and Detection of Binary Amplitude shift keying (BASK)
8. Generation of Binary FSK signal modulation (FSK)
9. Observing Eye pattern

Books Recommended:

Textbooks:

1. Haykin Simon, *Digital Communication Systems*, 4th Edn. John Wiley and Sons.
2. H. Taub, D. Schlling, and G. Saha, *Principles of Communication Systems*, 3rd Edn. Tata Mc-Graw Hill.
3. Lathi B P, and Ding Z., *Modern Digital and Analog Communication Systems*, 4th Edn, Oxford University Press.

Reference Books:

1. Sklar B, and Ray P. K., *Digital Communication: Fundamentals and applications*, 2nd Edn, Pearson Publication.
2. T L Singal, *Analog and Digital Communication*, 1st Edn, Tata Mc-Graw Hill.
3. P Ramakrishna Rao, *Digital Communication*, 1st Edn, Tata Mc-Graw Hill.
4. M F Mesiya, *Contempory Communication systems*, 1st Edn, Tata Mc-Graw Hill.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Laboratory:

1. Oral examination will be based on the entire syllabus including, the practical's performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

1. Term work shall consist of minimum 7 experiments, 1 Power Point Presentation and minimum 2 assignments.

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks
ii. Journal Documentation (Write-up, Power Point Presentation and Assignments: 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Syllabus for Third Year Electronics and Telecommunication Engineering-Semester VI (Autonomous)
(Academic Year 2021-2022)

<table>
<tr><td colspan="8">Program: Third Year Electronics and Telecommunication Engineering</td><td colspan="3">Semester: VI</td></tr>
<tr><td colspan="8">Course: Radiating Systems</td><td colspan="3">Course Code: DJ19ECC602</td></tr>
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Pre-requisite:

1. Electromagnetics and Wave Propagation

Objectives:

1. To learn fundamental parameters of Antenna
2. To learn about linear wire antenna elements and Antenna arrays
3. To learn about Special types of Antennas
4. To learn measurement procedures of Antenna parameters

Outcomes: On completion of the course, learner will be able to:

1. Discuss the concepts of antenna fundamentals like radiation pattern, directivity and gain.
2. Analyse the basic radiating elements like linear wire antenna and loop antenna.
3. Design Antenna Arrays for Isotropic and Directional Sources.
4. Design regular shape MSAs and Aperture antennas.
5. Measure antenna parameters like impedance, gain, radiation pattern using techniques like two antenna and three antenna method.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Antenna Fundamentals:** Review of Maxwells equations and vector potential wave equation. Antenna Parameters: Near field and far field radiation, dual equations for electric and magnetic current sources, radiation Mechanism, basic antenna parameters, Radiation pattern, radiation power density, radiation intensity, beam width, directivity, Antenna efficiency, Gain, beam efficiency, bandwidth, polarization, input impedance, antenna vector effective length and equivalent areas, antenna radiation efficiency, FRIIS transmission equation. **Measurement of Antenna parameters:** Input Impedance, Radiation Pattern, Gain (Two and Three antenna, method), Polarization.	**12**
2	**Wire Elements: Dipoles, Monopoles, Loops and Helical :** Infinitesimal dipole, radiation fields, radiation resistance, radiation sphere, near field, far field directivity, small dipole, finite length dipole, half wave length dipole, linear elements near or on infinite perfect conductors, Monopole antenna, Folded dipole. Design of dipole and monopole antenna. **Loop Antenna:** Small circular loop, comparison of small loop with short dipole, Ferrite loop, Radiation patterns, its parameters, and their applications. **Helical Antennas:** Input impedance matching, Axial mode and normal mode propagation, Circular polarization using Helical Antenna.	**10**
3	**Arrays:** Linear arrays, Array of two isotropic point sources, linear arrays of N elements, principle of pattern multiplication applicable to non-isotropic sources, Phase scanning arrays, Broadside and End-fire Array, Increased Directivity end fire array, Calculations of Directivity, Beam width, Maxima and null directions for N-element Array, basics of planar arrays. Design of Yagi antenna and Log Periodic antenna.	**10**
4	**Microstrip Antenna:** Microstrip antenna (MSA): Introduction, Feeding Techniques, Regular Shape MSAs (Rectangular, Circular, Equilateral Triangular), Design of Regular shape MSAs.	**06**
5	**Aperture Antennas:** Horn Antennas: E-Plane Sectoral Horn, H-Plane Sectoral Horn, Pyramidal Horn, Conical Horn Reflector Antennas: Introduction, Plane Reflector, Corner Reflector, Parabolic Reflector, Design considerations.	**06**

List of Laboratory Experiments: (Minimum Eight)

1. Study of Antenna types.
2. Plot Radiation Pattern of dipole and monopole using Antenna trainer kit/ simulation software .
3. Plot Radiation Pattern of dipole for varying length using simulation software.
4. Design of RMSA using simulation software.
5. Design of CMSA using simulation software.
6. Design of ETMSA using simulation software.
7. Plot Radiation Patterns of microstrip antenna using Antenna trainer kit.
8. Design of Broad side-end fire array.
9. Study of pattern multiplication.
10. Design of phase scanning array.

Books Recommended:

Text books:

1. C. A. Balanis, *Antenna Theory: Analysis and Design*, 3rd Edn, John Wiley & Sons, Hoboken, NJ.
2. J. D. Kraus, R. J. Marhefka, A.S. Khan, *Antennas & Wave Propagation*, 4th Edn, McGraw Hill Publications.
3. G. Kumar, K. P. Ray, *Broadband Microstrip Antenna*, 1st Edn, Artech House.

Reference books:

1. Stutzman, Theile, *Antenna Theory and Design*, 3rd Edn, John Wiley and Sons.
2. R. E. Collin, *Antennas and Radio Wave Propagation*, 4th Edn, International Student Edition, McGraw Hill.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Laboratory:

1. Oral examination will be based on the entire syllabus including the practicals performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

1. Term work shall consist of minimum 8 experiments.

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks

ii. Journal Documentation (Write-up, Assignments): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Syllabus for Third Year Electronic and Telecommunication Engineering - Semester VI (Autonomous)
(Academic Year 2021-2022)

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Pre-requisite: Knowledge of

1. Engineering Mathematics-IV
2. Digital Signal Processing

Fundamentals of Digital Image Processing (DJ19ECC603)

Objectives: On completion of the course, learner will be able to:

1. To cover the fundamentals, mathematical models and transformation techniques in digital image processing.
2. To develop time and frequency domain techniques for image enhancement.
3. Apply various image processing techniques and algorithms for developing different practical applications
4. Apply different classification and clustering techniques for object recognition and classification

Outcomes: On completion of the course, learner will be able to:

1. Interpret the fundamental concepts of a digital image processing system.
2. Analyse images in the frequency domain using various transforms.
3. Evaluate, compare and contrast the techniques for image enhancement and image restoration.
4. Interpret and apply image segmentation and representation techniques for object recognition.
5. Report and present experimental study conducted, with valid conclusions, for various image processing applications, including a case student/mini project completed in a group.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Digital Image Fundamentals:** Steps in Digital Image Processing, Components, Image Sampling and Quantization **Color Image Processing:** Color Fundamentals Color models	**04**
2	**Image Enhancement (point processing):** Image Negative, Thresholding, Gray level slicing with and without background, power law and log transform, Contrast Stretching, Histogram equalization and Histogram Specification **Image Enhancement in Spatial Domain (Neighborhood processing):** Basics of Spatial Filtering, Generating Spatial Filter Masks–Smoothing and Sharpening Spatial Filtering **Image Transforms:** 1-D DFT, 2-D Discrete Fourier Transform and Its Inverse, Some Properties of 2D DFT, Walsh -Hadamard, Discrete Cosine Transform, Haar Transform, Slant Transform **Image Enhancement in Frequency Domain**: The Basics of Filtering in the Frequency Domain, Smoothing and Sharpening frequency domain filters	**12**
3	**Morphology:** Erosion and Dilation, Opening and Closing, The Hit or-Miss Transformation. **Restoration**: Noise models – Mean Filters – Order Statistics – Adaptive filters –wiener filter	**06**
4	**Point, Line, and Edge Detection:** Detection of Isolated Points, Line detection, edge models, basic and advance edge detection, Edge linking and boundary detection, Canny's edge detection algorithm **Thresholding:** Foundation, Role of illumination, Basic Global thresholding, Otsu's method **Region Based segmentation:** Region Growing, Region Splitting and merging, Relationships between pixels, Hough transform **Region Identification:** chain code, simple geometric border representation, Fourier Transform of boundaries, Boundary description using segment sequences	**12**
5	**Object Recognition:** Knowledge representation, Classification Principles, Classifier setting, Classifier Learning, Support vector machine, Kernels, cluster analysis, K means Clustering	**08**

List of Laboratory Experiments: (minimum eight)

1.To perform basic Image Processing, Geometric, Arithmetic and Logical operations on images
2. To perform Spatial Domain Image Enhancement using different Point Processing techniques
3. To perform Spatial Domain Image Enhancement using different Neighborhood Processing techniques
4. To perform Histogram equalization
5. Application of Harr transform in image processing
6. To perform frequency domain Image Enhancement techniques
7. To perform region-based segmentation
8. To perform morphological operations on Image
9. To perform edge detection using basic and advanced techniques
10. To perform Image restoration using various filters
11. To perform classification using Support Vector Machine
12. To perform clustering using K-means algorithm

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

Books Recommended:

Text books:

1. Gonzales and Woods, *Digital Image Processing*, 3rd Pearson Education, India.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle, *Image Processing, Analysis, and Machine Vision*, 3rd Edn,Cengage Engineering, 2013.

Reference books:

1. Anil K Jain, *Fundamentals of Image Processing*, 1st Edn,Prentice Hall of India,1989.
2. W Pratt, *Digital Image Processing*, 3rd Edn, Wiley Publication, 2002

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Laboratory:

1. Oral examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

Term work shall consist of minimum 8 experiments and an assignment based on any topic from the syllabus.

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks
ii. Journal Documentation (Write-up, Assignments, Case study): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Syllabus for Third Year Electronic and Telecommunication Engineering - Semester VI (Autonomous)
(Academic Year 2021-2022)

<table>
<tr><td colspan="9">Program: Third Year Electronics and Telecommunication Engineering</td><td colspan="3">Semester: VI</td></tr>
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</table>

Pre-requisite:

1. Analog Communication

Objectives:

1. To learn various hardware network components.
2. To understand network reference models and process involved in data communication.
3. To understand the protocols working at different layers.
4. To design and configure a network for an organization.

Outcomes: On completion of the course, learner will be able to:

1. Differentiate functions of various layers of OSI model and compare the layered architecture with TCP/IP protocol suite. Identify and understand the working of various networking devices.
2. Define characteristics of different physical media and differentiate other communication networks and multiplexing techniques.
3. Differentiate various components in data link layer, various datalink layer protocols.

4. Design network and subnetwork on the basis of network protocol and routing algorithms and carrying out required investigations and troubleshooting.
5. Distinguish transport layer protocols based on application. Report and present the experimental study conducted along with valid conclusions.

Detailed Syllabus: (unit wise)

Unit	Description	Duration
1	**Introduction to computer network:** Reference Models, OSI model, overview of TCP/IP, layer functions, services, peer to peer protocols, sockets and ports, Data encapsulation, Networking devices: Repeater, hub, bridge, switch and routers, Network topology.	06
2	**Introduction to Physical layer Services:** Introduction to physical media, Coax, RJ 45, Optical fiber, twisted pair, bit transmission, frequency division multiplexing. Time division multiplexing.	04
3	**The Data Link Layer:** Data link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols: Stop and Wait protocol, Go-back-n protocol, Selective-repeat protocol, Example Data Link Protocols: HDLC: High-Level Data Link Control, The Data Link Layer in The Internet, Channel Allocation Problem, Multiple Access Protocols.	10
4	**The Network Layer:** Network functions for the Network Layer Functions, Routing Algorithms: Distance vector and Link state routing, shortest path first algorithm: Dijikstra and Bellman Ford algorithm, Quality of Service. Network Layer In The Internet: The IP Protocol, IPv4 header, IP Addressing classfull and classless, CIDR notation, Subnetting, suppernetting, Internet Control Protocols, The Interior Gateway Routing Protocol: RIP, OSPF, and The Exterior Gateway Routing Protocol: BGP.	10
5	**The Transport Layer:** The Transport Service, Elements of Transport Protocols, The Internet Transport Protocol: TCP and UDP, The Internet Transport Protocol: TCP:-Introduction to TCP, The TCP, Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, Modelling TCP Connection Management, TCP Transmission Policy, TCP Congestion Control, TCP Timer Management.	10

List of Laboratory Experiments: (minimum eight)

1. To implement different networking command using cisco packet tracer.
2. To study various hardware and software network components.
3. To configure the Web (HTTP and DNS), FTP and SMTP server using cisco packet tracer.
4. To configure RIP protocol in a network using Cisco packet tracer.
5. To configure OSPF protocol in a network using Cisco packet tracer.
6. To establish TELNET session using Cisco packet tracer.
7. To design Firewall using standard and extended ACL's.
8. To study VLSM using Cisco packet tracer.
9. To implement Dijikstras algorithm.
10. To implement Bellman Ford algorithm.
11. To analyze network traffic: HTTP, TCP, UDP using Wireshark..

Books Recommended:

Text books:

1. A. S. Tanenbaum, *Computer Network*, 4th Edn, Prentice Hall
2. B. F. Ferouzan, *Data and Computer Communication*, 4th Edn, Tata McGraw Hill.

Reference Books:

1. Kurose, Ross, *Computer Networking*, 6th Edn, Addison Wesley.
2. W. Richard Stevens, *TCP/IP*, 2nd Edn, Addison Wesley.
3. D. E. Comer, *Computer Networks and Internets*, 6th Edn, Pearson Publication.
4. B. F. Ferouzan, *TCP/IP Protocol Suite*, 1st Edn, Tata Mc-Graw Hill.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Laboratory:

1. Oral examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each will be conducted during the semester.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

1. Term work shall consist of minimum 8 experiments, and a case study based on any one topic is compulsory.

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks
ii. Journal Documentation (Write-up, Power Point Presentation and Assignments: 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Syllabus for Third Year Electronic and Telecommunication Engineering - Semester VI (Autonomous)
(Academic Year 2021-2022)

Program: Third Year Electronic and Telecommunication Engineering	**Semester: VI**
Course: Advanced VLSI	**Course Code:DJ19ECEC6011**
Course: Advanced VLSI – Laboratory	**Course Code: DJ19ECEL6011**

Teaching Scheme (Hours / week)				**Evaluation Scheme**						
				Semester End Examination Marks (A)			**Continuous Assessment Marks (B)**			**Total marks (A+ B)**
Lectures	**Practical**	**Tutorial**	**Total Credits**	**Theory**			**Term Test 1**	**Term Test 2**	**Avg.**	
				75			**25**	**25**	**25**	**100**
				Laboratory Examination			**Term work**		**Total Term work**	**50**
3	**2**	**--**	**3+1=4**	**Oral**	**Practical**	**Oral & Practical**	**Laboratory Work**	**Tutorial / Mini project / presentation/ Journal**		
				25	**--**	**--**	**15**	**10**	**25**	

Pre-requisite:

1. Analog Circuit Design
2. Integrated Circuits
3. Basic VLSI

Objectives:

1. To highlight the circuit design issues in the context of Analog VLSI technology
2. To provide the understanding of different design styles.
3. To provide an exposure to drawing layout of circuits.

Outcomes: At the end of course, student will be able to:

1. Understand the MOS Models. Design and explain passive and active current mirrors.
2. Analyze and design Single Stage Amplifiers. Perform simulation using EDA tool, debug to obtain the desired result.
3. Analyze and design differential Amplifiers. Perform simulation using EDA tool, debug to obtain the desired result.

4. Realize Op-amp amplifiers. Carry out necessary investigations on the simulated circuit, infer from the results obtained and correlate them with theoretical interpretations.
5. Analog layout techniques. Report and present the experimental study conducted along with valid conclusions.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**CMOS Analog building blocks:** MOS Models: Necessity of CMOS analog design, Review of characteristics of MOS device, MOS small signal model, MOS spice models. Passive and Active Current Mirrors: Basic current mirrors, Cascode current mirrors and Active current mirrors. Band Gap References: General Considerations, Supply-independent biasing, Temperature independent references, PTAT current generation and Constant Gm biasing.	**10**
2	**Single Stage Amplifiers:** Configurations: Basic concepts, Common source stage, Source follower, Common gate stage, Cascade stage. Frequency Response and Noise: General considerations, Common-source stage, Source followers, Common-gate stage, Cascode stage and Noise in single stage amplifier.	**10**
3	**Differential Amplifiers:** Configurations: Single ended and differential operation, Basic differential pair, Common-mode response, Differential pair with MOS loads, Gilbert cell, Frequency response and noise in differential pair.	**08**
4	**MOS Operational Amplifiers:** Op-amp Design: General Considerations, performance parameters, One stage op-amps, Two-stage op-amps, Gain Boosting, Common-mode feedback, Input range limitations, Slew Rate, Power supply rejection, Noise in op-amps. Stability and Frequency Compensation: General Considerations, Multi pole systems, Phase margin, Frequency compensation.	**08**
5	**Analog Layout and other concepts:** Analog Layout Techniques: Antenna effect, Resistor matching, capacitor matching, active device design, current mirror matching, floor planning, shielding and guard rings.	**04**

List of Laboratory Experiments: (minimum eight)

1. To study trans-conductance plots of MOSFET device (voltage bias, current bias and technology bias).
2. To design of basic amplifier.
3. To design of cascode amplifier.
4. To design of basic current sink.
5. To design current sink by using negative feedback resistor.
6. To design of cascode current sink.
7. To design of positive feedback boot strap current sink.
8. To design of regulated cascode current sink.
9. To design of simple current mirror.
10. To design of cascode current mirror.
11. To design of Wilson current mirror.

Books Recommended:

Textbooks

1. B Razavi, *Design of Analog CMOS Integrated Circuits*, 1st Edn, Tata McGraw Hill.
2. R. Jacob Baker, Harry W. Li, David E. Boyce, *CMOS Circuit Design, Layout, and Stimulation*, 3rd Edn, Wiley Publication.
3. P. E. Allen and D. R. Holberg, *CMOS Analog Circuit Design*, 3rd Edn, Oxford University Press.

Reference Books:

1. Mohammed Ismail and Terri Faiz, *Analog VLSI Signal and Information Process*, 1st Edn, Tata McGraw-Hill.
2. John P. Uyemura, *CMOS Logic Circuit Design*, 1st Edn, Springer.
3. Gray, Meyer, *Analysis and design of Analog Integrated Circuits*, 5th Edn, Willey Publication.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Laboratory:

1. Oral examination will be based on the entire syllabus including, the practical's performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each will be conducted during the semester.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

1. Term work shall consist of minimum 8 experiments, 1 Power Point Presentation and assignment.

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks
ii. Journal Documentation (Write-up, Power Point Presentation and Assignments: 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Syllabus for Third Year Electronic and Telecommunication Engineering - Semester VI (Autonomous)
(Academic Year 2021-2022)

Program: Third Year Electronics and Telecommunication Engineering	**Semester: VI**
Course: Data Compression & Encryption	**Course Code: DJ19ECEC6012**
Course: Data Compression & Encryption - Laboratory	**Course Code: DJ19ECEL6012**

Teaching Scheme (Hours / week)				**Evaluation Scheme**						
				Semester End Examination Marks (A)			**Continuous Assessment Marks (B)**			**Total marks (A+ B)**
Lectures	**Practical**	**Tutorial**	**Total Credits**	**Theory**			**Term Test 1**	**Term Test 2**	**Avg.**	
				75			**25**	**25**	**25**	**100**
				Laboratory Examination			**Term work**		**Total Term work**	**50**
3	**2**	**--**	**3+1=4**	**Oral**	**Practical**	**Oral & Practical**	**Laboratory Work**	**Tutorial / Mini project / presentation/ Journal**		
				25	**--**	**--**	**15**	**10**	**25**	

Pre-requisite:

1. Engineering Mathematics IV
2. Digital Signal Processing
3. Computer Networks

Objectives:

1. Understand the lossy and lossless compression for text, audio, image and video.
2. Understand concept of Symmetric and Asymmetric key cryptography.

Outcomes: On completion of the course, learner will be able to:

1. Describe various lossy and lossless techniques.
2. Apply various compression techniques for compression of text, image, audio and video.
3. Describe the range of different cryptosystems and various network security related protocol.
4. Analyze how the basic design criteria for various cryptosystems like confusion, diffusion and number theory are used in cryptographic techniques.

5. Gain ability to work in teams to solve complex problems and communicate effectively with technical reports/ write-ups.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Text compression:** Introduction to data compression, Comparison of lossy and lossless compression, Modelling and Coding, Compression Parameters. Huffman Coding, Adaptive Huffman Coding, Arithmetic coding. Dictionary based compression: Static and Dynamic Dictionary, LZ77, LZ78, LZW.	**04**
2	**Image Compression:** Differential lossless compression DPCM, JPEG-LS, DCT, JPEG, JPEG 2000.	**08**
3	**Audio and Video Compression:** Digital Audio, μ law and A law companding, MPEG-1 Audio layer (MP3 audio format). Analog Video, Digital Video, MPEG-2, H.261 encoder and decoder.	**08**
4	**Symmetric key cryptography & Key management:** Introduction: Security Goals, Security techniques – Cryptography and Steganography, Cryptographic attacks. Symmetric Key Cryptography: Substitution cypher, Transposition Cypher, Stream and Block cypher. DES, Double DES, Triple DES, AES. Key management, Diffie- Hellman Key Exchange.	**08**
5	**Asymmetric key cryptography and Message Integrity:** Prime numbers, Fermat's and Euler's theorem, Chinese Remainder theorem. Principles of Public Key cryptosystem, RSA. Message Integrity: Massage authentication and Hash functions, SHA, HMAC, Digital Signature Standard.	**08**
6	**Network Security:** Email, PGP, S/MIME, Intrusion detection system. Web security considerations, SSL, TLS, Secure Electronic transaction. Kerberos, X.509 authentication service, Public Key Infrastructure.	**04**

List of Laboratory Experiments: (minimum eight)

1. To find compression ratio after compression of various file formats.

2. To implement Huffman coding/ Arithmetic coding/ LZ78 dictionary coding.
3. To implement μ law and A law companding for Audio compression.
4. To implement DCT for image compression.
5. To implement Substitution cypher/ Transposition cypher for text/ image
6. To implement square and multiply algorithm.
7. To implement Fermat's theorem.
8. To implement RSA.
9. To implement Diffie-Hellman Key exchange mechanism.
10. To implement PGP.
11. To study X.509 certificate format by downloading few samples from Internet.

Books Recommended:

Text books:

1. Khalid Sayood, *Introduction to Data Compression*, 2nd Edn, Morgan Kaufman.
2. William Stallings, *Cryptography and Network Security Principles and Practices*, 5th Edn, Pearson Publication.
3. Behrouz A. Forouzan, *Cryptography and Network Security*, 2nd Edn, Tata McGraw-Hill.

Reference books:

1. David Saloman, *Data Compression: The Complete Reference*, 3rd Edn, Springer.
2. Mark Nelson and Jean- Loup Gailly, *The Data Compression Book*, 2nd Edn, BPB Publications
3. Matt Bishop, "Computer Security Art and Science", Addison- Wesley, 2002.

Evaluation Scheme:

Semester End Examination (A):

Theory:

3. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
4. Total duration allotted for writing the paper is 3 hrs.

Laboratory:

5. Oral examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

Continuous Assessment (B):

Theory:

4. Two term tests of 25 marks each will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.
5. Total duration allotted for writing each of the paper is 1 hr.
6. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

2. Term work shall consist of minimum 8 experiments, and a case study based on any one topic is compulsory.

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks
ii. Journal Documentation (Write-up, Assignments, Case study): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Syllabus for Third Year Electronic and Telecommunication Engineering - Semester VI (Autonomous)
(Academic Year 2021-2022)

<table>
<tr><td colspan="9">Program: Third Year Electronics and Telecommunication Engineering</td><td colspan="3">Semester: VI</td></tr>
<tr><td colspan="9">Course: Television & Broadcast Technology</td><td colspan="3">Course Code: DJ19ECEC6013</td></tr>
<tr><td colspan="9">Course: Television & Broadcast Technology - Laboratory</td><td colspan="3">Course Code: DJ19ECEL6013</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme (Hours / week)</td><td colspan="8">Evaluation Scheme</td></tr>
<tr><td colspan="5">Semester End Examination Marks (A)</td><td colspan="3">Continuous Assessment Marks (B)</td><td rowspan="2">Total marks (A+ B)</td></tr>
<tr><td rowspan="3">Lectures</td><td rowspan="3">Practical</td><td rowspan="3">Tutorial</td><td rowspan="3">Total Credits</td><td colspan="5">Theory</td><td>Term Test 1</td><td>Term Test 2</td><td>Avg.</td></tr>
<tr><td colspan="5">75</td><td>25</td><td>25</td><td>25</td><td>100</td></tr>
<tr><td colspan="5">Laboratory Examination</td><td colspan="3">Term work</td><td rowspan="3">Total Term work</td><td rowspan="3">50</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">2</td><td rowspan="2">--</td><td rowspan="2">3+1=4</td><td>Oral</td><td>Practical</td><td>Oral & Practical</td><td>Laboratory</td><td>Tutorial / Mini project / presentation/ Journal</td></tr>
<tr><td>25</td><td>--</td><td>--</td><td>15</td><td>10</td><td>25</td></tr>
</table>

Pre-requisite:

1. Analog Communication
2. Signal and Systems
3. Electromagnetic & Wave Propagation

Objectives:

1. Provide knowledge of Colour TV, Broadcast Technology and Advanced TV systems.
2. Understand the colour signal transmission, video signal format and compression Techniques.
3. Understand the basic principles of Radio and sound Technology.
4. Understand the fundamental of digital signal transmission, IPTV, DTH, D2-MAC/packet signal and MAC decoding.

Outcomes: On completion of the course, learner will be able to:

1. Identify different parameters of audio/video signals in TV broadcasting.
2. Recognize the principle of various advanced TV technologies and Calibrate technical parameters.

3. Understand the various Radio Broadcasting Systems
4. Design Broadcasting link for direct broadcast system.
5. Gain ability to work in teams to solve complex problems and communicate effectively with technical reports / write-ups.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Video and Broadcast Technology:** Analogue and Digital technology, frame and field, scanning process, Interlaced and Progressive scanning, Composite video signal, Component video signal, Resolution, Aspect ratio, Broadcast standards--NTSC, PAL, SECAM and HDTV, Telecine, Camera tubes: basic principle ,Vidicon and Image orthicon.	**08**
2	**Video Format and Compression Techniques:** Types of Videotapes; Analogue tape, Digital tape, Video compression, Sampling, Intra and Inter frame compression, TBC, Camera cables, connectors, SMPTE Time Code, Control track, eyeballing-monitor setup.	**06**
3	**Radio and Sound Technology :** Public Vs Private broadcasting systems in India; Radio Broadcasting Systems--MW, SW, FM. Internet Radio, Podcasting: Satellite Radio, Community Radio. Evolution of film sound, optical sound track, Audio formats, Dolby, digital sound, Types of recorders-open reel, cassette recorders and Digital. Analogue and Digital Audio, bit, sampling, multi-track recording.	**10**
4	**Color TV:** Compatibility considerations, Color theory, chromaticity diagram, generation of color TV signals, luminance signal, chrominance signal, Frequency interleaving process,color subcarrier frequency, NTSC system- transmitter and receiver, PAL system- transmitter and receiver. Displays : Principle, working, advantages and disadvantages of Plasma, LED,LCD	**10**
5	**Transmission technologies :** Terrestrial transmission; Satellite and Cable broadcasting; Up linking and Down linking, Conditional Access System, DTH; IPTV.MAC signal, D2-MAC/packet signal, MAC decoding.	**06**

List of Laboratory Experiments: (minimum eight)

1. To understand working of various stages of Colour TV receiver.
2. To observe and measure Composite video signal for various video patterns and corresponding sweep waveform in the Colour TV receiver.
3. To observe the construction of Monochrome, colour picture tube, Vidicon camera tube and measuring various voltages.
4. To find out various faults and trace circuits in Colour TV receiver.
5. Installation of satellite dish antenna and measurement of LNB frequency, RF power with DTH system for reception of TV channels.
6. Comparison of Analog (CRT), LCD TV, Plasma TV and HDTV.
7. Measuring different voltages using Switch mode power supply (SMPS).
8. Understanding principle of light emitting diode (LED) TV and comparing LED TV and LCD TV technology.
9. Generation of colour signal and various video patterns.
10. Video signal sampling and compression techniques.
11. Transmission and reception of D2-MAC/ packet signals.
12. Audio and video signal transmission using satellite uplink and downlink.

Books Recommended:

Text books:

1. R. R. Gulati, *Monochrome and Colour Television*, 2nd Edn, New Age International Publication.
2. A.M. Dhake, *Television and Video Engineering*, 2nd Edn, Tata McGraw Hill Publication.
3. Charles Poynton, *San Francisco, Digital video and HDTV, Algorithms And Interfaces*, 5th Edn, Morgan Kaufmann Publishers.
4. Stan Prentiss, *High Definition TV*, 2nd Edn, Tata McGraw Hill Publication.

Reference Books:

1. Walter Fischer, *Digital Television: A Practical Guide for Engineers (Signals and Communication Technology),1*st Edn, Springer.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Laboratory:

1. Oral examination will be based on the entire syllabus including, the practical's performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

1. Term work shall consist of minimum 8 experiments, and a case study based on any one topic is compulsory.

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks
ii. Journal Documentation (Write-up, Assignments, Case study): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Syllabus for Third Year Electronic and Telecommunication Engineering - Semester VI (Autonomous)
(Academic Year 2021-2022)

Program: Third Year Electronics and Telecommunication Engineering	**Semester: VI**
Course: Artificial Intelligence & Machine Learning	**Course Code: DJ19ECEC6014**
Course: Artificial Intelligence & Machine Learning - Laboratory	**Course Code: DJ19ECEL6014**

Teaching Scheme (Hours / week)				**Evaluation Scheme**						
				Semester End Examination Marks (A)			**Continuous Assessment Marks (B)**			**Total marks (A+ B)**
Lectures	**Practical**	**Tutorial**	**Total Credits**	**Theory**			**Term Test 1**	**Term Test 2**	**Avg.**	
				75			**25**	**25**	**25**	**100**
				Laboratory Examination			**Term work**		**Total Term work**	**50**
3	**2**	**--**	**3+1=4**	**Oral**	**Practical**	**Oral & Practical**	**Laboratory Work**	**Tutorial / Mini project / presentation/ Journal**		
				25	**--**	**--**	**15**	**10**	**25**	

Pre-requisite:

1. Engineering Mathematics IV

Objectives:

1. To teach the basics of Artificial Intelligence and Optimization Algorithms.
2. To deliver the fundamental concepts and techniques of Machine Learning.
3. To make students familiar with regression, classification and clustering methods.

Outcomes: On completion of the course, learner will be able to:

1. Choose and Implement an appropriate problem-solving method for an agent to find a sequence of actions to reach the goal state.
2. Apply optimization algorithm for real world applications.
3. Analyse the strength and weakness of AI approaches to knowledge representation, reasoning and planning.

4. Construct and demonstrate supervised and unsupervised ANN for real world applications.

Detailed Syllabus:		
Unit	**Description**	**Duration**
1	**Introduction to Artificial Intelligence (AI):** Introduction and Definition of Artificial Intelligence. Intelligent Agents: Agents and Environments, Concept of Rationality, Nature of Environments, Structure of Agents.	**04**
2	**Problem Solving by Searching:** Problem Solving Agent, Formulating Problems, Example Problems. **Uninformed Search Methods:** Depth Limited Search, Depth First Iterative Deepening (DFID), **Informed (Heuristic) Search Methods**: Greedy best-first search**,** A* Search. **Optimization Problems**: Hill climbing Search, Simulated annealing, Genetic algorithm, Ant colony optimization, Case study: Travelling salesman problem.	**08**
3	**Knowledge representation and Reasoning:** Knowledge based agents, Knowledge representation using logic, Propositional logic, Properties of propositional logic statements, Semantics of propositional logic, Resolution algorithm, Inference in Semantics of propositional logic, Resolution algorithm, case study: Wumpus world. Introduction to knowledge representation in FOL.	**08**
4	**Introduction to Machine Learning** Machine Learning basics, Types of Machine Learning. **Introduction to Artificial Neural Network** Fundamental concept, Biological Neuron, Artificial Neural Networks, NN architecture, Activation functions.	**05**
5	**Supervised Learning** Linear Regression Case study: Predicting house prices with Linear Regression, Linear Regression with one variable, Cost function, Gradient descent. Classifying with k-Nearest Neighbours, Splitting datasets one feature at a time: decision trees, Classifying with probability theory: Naïve Bayes, Logistic regression, Support Vector Machines.	**12**
6	**Unsupervised Learning** Grouping unlabelled items using k-means clustering. **Dimensionality Reduction** Principal Component Analysis (PCA)	**05**

List of Laboratory Experiments: (minimum eight)

1. Problem solving by any one search method.
2. Travelling Salesman Problem with Genetic Algorithm/Ant Colony Optimization.
3. Predicting house prices by Linear Regression.
4. Classify items using Logistic Regression.
5. Find the minimum of a polynomial by Steepest Descent Method.
6. Data segregation by K means clustering.
7. Train a Single layer Perceptron Learning algorithm.
8. To implement Support Vector Machines.
9. Dimensionality reduction by Principal Component Analysis.
10. To implement Naïve Bayesian algorithm.

Books Recommended:

Text Books:

1. Stuart J. Russell and Peter Norvig, *Artificial Intelligence, A Modern Approach*, 3rd Edn, Pearson Education.
2. Deepak Khemani, *A First Course in Artificial Intelligence*, 2013 McGraw Hill (India) Pvt. Ltd.
3. N.P. Padhy, *Artificial Intelligence and Intelligent Systems*, 2005, Oxford University Press.
4. Peter Harrington, *Machine Learning In Action*, 2012, DreamTech Press.
5. Ethem Alpaydin, *Introduction to Machine Learning*, 2020, MIT Press.
6. Tom M. Mitchell, *Machine Learning, 2017*, McGraw Hill Education.

Reference Books:

1. Elaine Rich and Kevin Knight, *Artificial Intelligence*, 3rd Ed., Tata McGraw-Hill Education Pvt. Ltd.
2. Stephen Marsland, *Machine Learning, An Algorithmic Perspective*, 2014, Taylor & Francis.
3. Kevin P. Murphy, *Machine Learning, A Probabilistic Perspective*, 2012, MIT Press.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Laboratory:

1. Oral examination will be based on the entire syllabus including the practical performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each will be conducted during the semester out of which one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

1. Term work shall consist of minimum 8 experiments.

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks

ii. Journal Documentation (Write-up, Tutorials): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Syllabus for Third Year Electronic and Telecommunication Engineering - Semester VI (Autonomous)
(Academic Year 2021-2022)

<table>
<tr><td colspan="8">Program: Third Year Electronics and Telecommunication Engineering</td><td colspan="3">Semester: VI</td></tr>
<tr><td colspan="8">Course: Robotics</td><td colspan="3">Course Code: DJ19ECEC6015</td></tr>
<tr><td colspan="8">Course: Robotics - Laboratory</td><td colspan="3">Course Code: DJ19ECEL6015</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme (Hours / week)</td><td colspan="7">Evaluation Scheme</td></tr>
<tr><td colspan="3">Semester End Examination Marks (A)</td><td colspan="3">Continuous Assessment Marks (B)</td><td rowspan="2">Total marks (A+ B)</td></tr>
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<tr><td colspan="3">75</td><td>25</td><td>25</td><td>25</td><td>100</td></tr>
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<tr><td>25</td><td>--</td><td>--</td><td>15</td><td>10</td><td>25</td></tr>
</table>

Pre-requisite:

1. Engineering Mathematics III & IV
2. Control Systems

Objectives:

1. To study basics of robotics.
2. To familiarize students with kinematics and dynamics of robots.
3. To familiarize students with trajectory and task planning of robots.
4. To familiarize students with robot vision.

Outcomes: On completion of the course, learner will be able to:

1. Understand the basic concept of robotics.
2. Analyze the kinematic and the dynamic characteristics used in robotics.
3. Design trajectory and path planning for a robotic system.

4. Understand the importance of visionary system in robotic manipulation.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Fundamentals of Robotics:** Robot classification, robot components, robot specifications, joints, coordinates, coordinate frames, workspace, languages, and applications.	**04**
2	**Kinematics of Robots:** Homogeneous transformation matrices, Inverse transformation matrices, forward and reverse kinematic equations, position and orientation, Denavit-Hatenberg representation of forward kinematics, forward and reverse kinematic solution of three and four axis robot.	**08**
3	**Velocity Kinematics & Dynamics:** Differential motions and velocities, its relationship, Jacobian, differential motion of a frame and robot, inverse Jacobian, singularities, dynamic analysis of forces, Lagrangian mechanics, Newton Euler formulation, dynamic equations of two axis robot.	**10**
4	**Robot Vision:** Basics of Trajectory Planning, joint-space trajectory planning, Cartesian-space trajectories, Image representation, template matching, polyhedral object, shape analysis, segmentation, Iterative processing, perspective transform and camera calibration	**10**
5	**Task Planning:** Task level programming, Uncertainty, Configuration space, Gross motion planning, Fine-motion planning, Simulation of planner motion, Source and goal scenes and Task planner simulation	**08**

List of Laboratory Experiments: (minimum eight)

1. To implement Forward Kinematics Algorithm.
2. To implement Inverse Kinematics Algorithm.
3. To perform Dynamic analysis of two-axis using kinematics.
4. To implement Dynamic equations for two axis robot.
5. To implement Joint-space trajectory.
6. To implement Cartesian-space trajectory.
7. To implement Template matching.
8. To implement Iterative processing.
9. Simulation of planner motion.

10. To implement Object shape analysis.

Books Recommended:

Text books:

1. Robert Shilling, *Fundamentals of Robotics-Analysis and control*, 1st Edn, Prentice Hall of India.
2. Saeed Benjamin Niku, *Introduction of Robotics-Analysis, control, Applications*, 2nd Edn, Wiley India Pvt. Ltd.

Reference books:

1. John J. Craig, *Introduction to Robotics-Mechanics and Control*, 3rd Edn, Pearson Education.
2. Mark W. Spong, Seth Hutchinson, M. Vidyasagar, *Robot Modeling and Control*, 1st Edn, Wiley India Pvt.
3. Mikell P. Groover et.al. *Industrial Robots-Technology, Programmimg and Applications*, 1st Edn, McGraw Hill.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Laboratory:

1. Oral examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

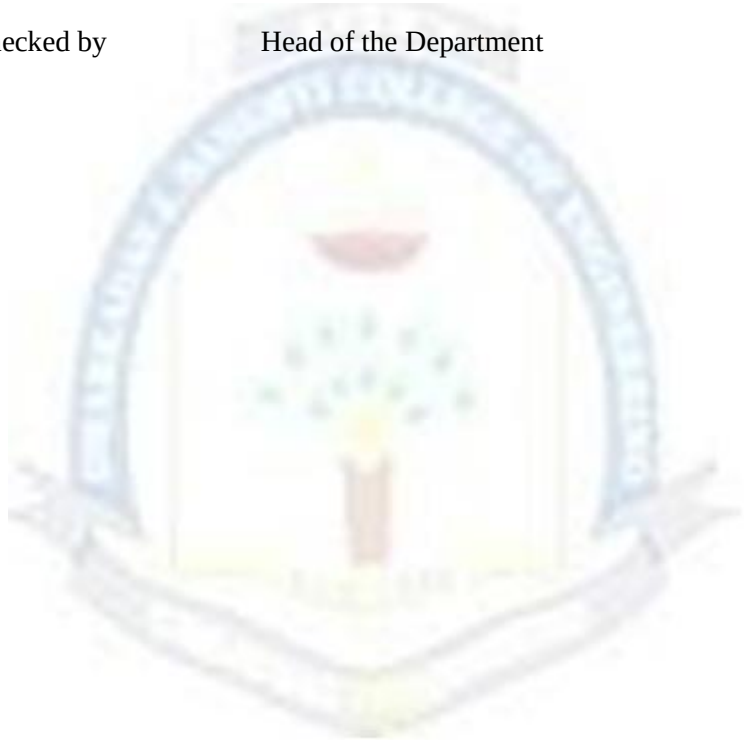
1. Term work shall consist of minimum 8 experiments, and a case study based on any one topic is compulsory.

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks
ii. Journal Documentation (Write-up, Assignments, Case study): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal



Syllabus for Third Year Electronic and Telecommunication Engineering - Semester VI (Autonomous)
(Academic Year 2021-2022)

Program: Third Year Electronics and Telecommunication Engineering	**Semester: VI**
Course: Advanced Power Electronics	**Course Code: DJ19ECEC6016**
Course: Advanced Power Electronics - Laboratory	**Course Code: DJ19ECEL6016**

Teaching Scheme (Hours / week)				**Evaluation Scheme**						
				Semester End Examination Marks (A)			**Continuous Assessment Marks (B)**			**Total marks (A+ B)**
Lectures	**Practical**	**Tutorial**	**Total Credits**	**Theory**			**Term Test 1**	**Term Test 2**	**Avg.**	
				75			**25**	**25**	**25**	**100**
				Laboratory Examination			**Term work**		**Total Term work**	**50**
3	**2**	**--**	**3+1=4**	**Oral**	**Practical**	**Oral & Practical**	**Laboratory Work**	**Tutorial / Mini project / presentation / Journal**		
				25	**--**	**--**	**15**	**10**	**25**	

Pre-requisite:

1. Control Systems
2. Power Electronics

Objectives:

1. Enhance & implement complex analytical methods in design of power electronics systems.
2. Extend the importance various applications of power electronics in electronics equipment, drives and non-conventional energy systems.

Outcomes: On completion of the course, learner will be able to:

1. Understand the modern methods of analysis and control of power electronic systems.
2. Analyze the power rectifiers with different industrial loads.
3. Design the AC inverters and DC-DC converters.
4. Design speed control techniques for industrial motors.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Three-phase Rectifiers:** 3-phase half-wave and full-wave controlled rectifiers with R and RL load, Effect of source inductance. Distortion in line current, calculation of performance parameters.	**08**
2	**Three-phase inverters and control:** Three phase bridge inverters (120^0 and 180^0 conduction mode) with R and RL load. PWM for 3-phase voltage source inverters, Space Vector Modulation (SVM) technique for phase voltage source inverters, hysteresis control.	**08**
3	**DC-DC Converters:** Average model, linearized transfer function models, state-space average models of basic buck, boost and buck-boost converters. Feedback control of these converters (PI and PID).	**08**
4	**Power Electronic Applications in DC Drives:** Introduction to DC motors, speed control of DC motor, drives with semi converters, full converters and dual converters. Chopper-based drive. Electric braking of DC motors.	**08**
5	**Power Electronic Applications in AC Drives:** Introduction to three-phase induction motor, speed control methods for three-phase induction motor: Stator Voltage, Variable Frequency, Rotor resistance, V/F Control, Slip Power Recovery Schemes.	**08**

List of Laboratory Experiments: (minimum eight)

1. Single Phase Full Controlled Bridge Rectifier.
2. Speed control of separately excited DC motor using Armature Voltage Control.
3. Speed control of 3-phase Induction Motor using V/F control.
4. Simulation of 3-phase fully controlled Bridge rectifier with R and RL load.
5. Simulation of 1-phase fully controlled Bridge rectifier and study of various parameters.
6. Simulation of 1-phase Inverter and study of various Performance parameters.
7. Simulation of SVM Inverter.

8. Simulation of Closed loop dc-dc converter.
9. Study High Frequency Induction heating & Dielectric heating.
10. Study of operation and control of solid-state relays.

Books Recommended:

Text books:

1. Muhammad H. Rashid, *Power Electronics: Circuits, Devices and Applications*, 3rd Edn, PHI Publication.
2. Robert W. Erickson and Dragan Maksimovic, *Fundamentals of Power Electronics,* 2nd Edn, Springer.
3. Mohan, Undeland and Robbins, *Power Electronics: Converters, Applications and Design*, 2nd Edn, Wiley Publication.

Reference books:

1. P.S. Bimbhra, *Power Electronics*, 5th Edn, Khanna Publishers.
2. M. D. Singh, K. B. Khanchandani, *Power Electronics*, 2nd Edn, Tata McGraw Hill.
3. J. P. Agrawal, *Power Electronics Systems: Theory and Design*, 1st Edn, Pearson Publication.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus will comprise of 5 questions (All compulsory, but with internal choice as appropriate), each carrying 15 marks, total summing up to 75 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Laboratory:

1. Oral examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

Continuous Assessment (B):

Theory:

1. Two term tests of 25 marks each will be conducted during the semester out of which; one will be a compulsory term test (on minimum 02 Modules) and the other can either be a term test or an assignment on live problems or a course project.
2. Total duration allotted for writing each of the paper is 1 hr.
3. Average of the marks scored in both the two tests will be considered for final grading.

Laboratory: (Term work)

1. Term work shall consist of minimum 8 experiments, and a case study based on any one topic is compulsory.

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks
ii. Journal Documentation (Write-up, Assignments, Case study): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Prepared by Checked by Head of the Department Principal

Syllabus for Third Year Electronic and Telecommunication Engineering - Semester VI (Autonomous)
(Academic Year 2021-2022)

<table>
<tr><td colspan="9">Program: Third Year Electronics and Telecommunication Engineering</td><td colspan="3">Semester: VI</td></tr>
<tr><td colspan="9">Course: Microcontroller & Applications – Laboratory</td><td colspan="3">Course Code: DJ19ECSBL3</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme (Hours / week)</td><td colspan="8">Evaluation Scheme</td></tr>
<tr><td colspan="6">Semester End Examination Marks (A)</td><td colspan="3">Continuous Assessment Marks (B)</td><td rowspan="2">Total marks (A+ B)</td></tr>
<tr><td rowspan="3">Lectures</td><td rowspan="3">Practical</td><td rowspan="3">Tutorial</td><td rowspan="3">Total Credits</td><td colspan="6">Theory</td><td>Term Test 1</td><td>Term Test 2</td><td>Avg.</td></tr>
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</table>

Pre-requisite:

1. Digital System Design
2. Microprocessor & Microcontroller

Course objectives:

1. To develop background knowledge and core expertise in advanced microcontrollers.
2. To understand peripheral devices and their interfacing to advanced microcontrollers.
3. To write programs for microcontrollers and their applications in assembly and embedded C language.

Outcomes: After successful completion of the course, student will be able to

1. Understand the detailed architecture of LPC2148 microcontroller, Arduino & R-Pi Board.
2. Interface various peripheral devices to the LPC2148 microcontroller, Arduino & R-Pi Board.
3. Write Assembly language & Embedded C programming for microcontrollers.
4. Gain ability to work in teams to solve complex problems and communicate effectively with technical reports / write-ups.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**LPC 2148:** Salient features, applications, block diagram, memory mapping. Functional features of Interrupt controller, RTC, USB, UART, I2C, SPI, SSP controllers, watch dog timers and other system control units.	**06**
2	**Peripherals Duration:** Pin Connect Block- Features, Register description with example. GPIO-Features, Applications, Pin description, Register description with examples PLL-Features, block diagram, bit structure of PLLCON, PLLCFG, & PLLSTAT, and PLLFEED. PLL frequency.	**06**
3	**LPC 2148 Calculation:** Procedure for determining PLL settings, examples for PLL Configuration.	**02**
4	**Timers:** Features, applications, Architecture of timer module, register description, Simple C programs for application using -GPIO, PLL, Timer	**04**

List of Laboratory Experiments: (minimum eight)

1. To Study of ARM evaluation system.
2. Write a program for Interfacing ADC and DAC.
3. Write a program for Interfacing LED and PWM.
4. Write a program for Interfacing real time clock and serial port.
5. Write a program for Interfacing of seven segment displays.
6. Write a program for Interfacing keyboard and LCD.
7. Write a program for Interfacing EPROM and EEPROM.
8. Write a program for Interfacing DC and servo motors.
9. Write a program for Interfacing stepper motor and temperature sensor.
10. Implementing ZIGBEE protocol with ARM.

Books Recommended:

Text Books:

1. Andrew Sloss, Dominic Symes, and Chris Wright, *ARM System Developer's Guide*, 1st Edn, Morgan Kaufmann Publication.
2. Lyla Das, *Embedded Systems: An Integrated Approach*, 1st Edn, Pearson Publication.
3. James A. Langbridge, *Professional Embedded Arm Development*, 1st Edn, Wiley Publication.

Evaluation Scheme:

Semester End Examination (A):

Laboratory:

1. Oral examination will be based on the entire syllabus including, the practicals performed during laboratory sessions.

Continuous Assessment (B):

Laboratory: (Term work)

1. Term work shall consist of minimum 8 experiments, and a case study based on any one topic is compulsory.

The distribution of marks for term work shall be as follows:

i. Laboratory work (Performance of Experiments): 15 Marks
ii. Journal Documentation (Write-up, Case Study): 10 marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

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Syllabus for Third Year Electronic and Telecommunication Engineering - Semester VI (Autonomous)
(Academic Year 2021-2022)

<table>
<tr><td colspan="9">Program: Third year Electronics and Telecommunication Engineering</td><td colspan="2">Semester : VI</td></tr>
<tr><td colspan="9">Course : Innovative Product Development-IV</td><td colspan="2">Course Code: DJ19ILL2</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme
(Hours / week)</td><td colspan="7">Evaluation Scheme</td></tr>
<tr><td colspan="3">Semester End Examination Marks (A)</td><td colspan="3">Continuous Assessment Marks (B)</td><td rowspan="2">Total marks (A+ B)</td></tr>
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<tr><td>--</td><td>--</td><td>25</td><td>25</td><td>25</td><td>25</td></tr>
</table>

Pre requisite:

1. Analog and Digital Circuits
2. Analog and Digital Communication

Objectives:

1. To implement the solution as per the problem statement.
2. To develop the team building, writing, logical reasoning and management skills.
3. To provide the connections between the designs and concepts across different disciplinary boundaries.
4. To encourage students to become independent personnel, critical thinkers and lifelong learners

Outcomes: On completion of the course, learner will be able to:

1. Apply engineering knowledge to produce solution of a problem considering cultural, social, environmental, and economic factors using appropriate tool and method.
2. Demonstrate project based learning that allows students to transfer existing ideas into new applications.
3. Develop an ability to work in teams and manage the conduct of the research study.
4. Integrate different perspectives from relevant disciplines which help them to get internships, jobs and admission for higher studies.

5. Present the research in the form of technical paper writing, understand what constitutes to plagiarism and how to use proper referencing styles

Syllabus Domain knowledge (and beyond) needed from the following areas for the effective implementation of the project:

Microcontroller and Embedded Systems, Signal Processing, Microwave and Antennas, Networking and Internet of Things, Data science and Big data, Communication, Web and Application development, Robotics, AI and Machine learning

The above areas can be updated based on the technological innovations and development needed for specific project.

Guidelines:

The main purpose of this course is to improve the students' technical skills, communication skills by integrating writing, presentation and teamwork opportunities. Each project group have already under gone project topic allotment followed by two reviews in their fifth semester and in this semester, the students are expected to continue the project work.

1. Each group will be reviewed twice in a semester (January and March) and marks will be allotted based on the various points mentioned in the evaluation scheme.
2. In the first review of this semester, each group is expected to complete 50% of project and write first draft of the technical paper.
3. In the second review of this semester, each group is expected to complete 80% of project and submit final draft of the technical paper.
4. The technical paper will be published in DJ Strike magazine with ISBN number.
5. The students may use this opportunity to learn different computational techniques towards development of a product.
6. Interaction with alumni mentor will also be appreciated for the improvement of project.

Evaluation Scheme:

Semester End Examination (A):

Laboratory:

Oral examination should be conducted by Internal and External examiners. Students have to give presentation and demonstration based on 100% implementation of their project.

Continuous Assessment (B):

Laboratory: (Term work)

Each group will be reviewed twice in a semester by faculty guide and faculty coordinators based on the following criteria:

1. Project progress
2. Documentation/Technical paper writing
3. Key findings
4. Validation of results
5. Product Development

Each review consists of 25 marks. Average of the marks scored in both the reviews will be considered for final grading. The final certification and acceptance of TW ensures the satisfactory performance on the above aspects.

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Syllabus for Third Year Electronic and Telecommunication Engineering - Semester VI (Autonomous)
(Academic Year 2021-2022)

<table>
<tr><td colspan="9">Program: Third Year Electronics and Telecommunication Engineering</td><td colspan="3">Semester: VI</td></tr>
<tr><td colspan="9">Course: Environmental Engineering</td><td colspan="3">Course Code: DJ19A5</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme (Hours / week)</td><td colspan="8">Evaluation Scheme</td></tr>
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</table>

Pre-requisite: Interest in Environment and its impact on Human

Objectives:

1. Understand environmental issues such as depleting resources, pollution, ecological problems and the renewable energy scenario.
2. Familiarise environment related legislation

Outcomes: Students should be able to

1. Understand how human activities affect environment
2. Understand the various technology options that can make a difference

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Social Issues and Environment:** Ecological footprint and Carrying Capacity, Depleting nature of Environmental resources such as soil, water minerals and forests ,Carbon emissions and Global Warming.	**04**
2	**Technological growth for Sustainable Development:** Social, Economic and Environmental aspects of Sustainable Development, Renewable Energy Harvesting ,Concept of Carbon credit, Green Building ,Power and functions of Central Pollution Control Board and State Pollution Control Board	**04**
3	**Environmental impact due to technology:** Impact of Energy on Environment, Flow of Energy in Ecological system, Environment Degradation due to Energy, Control of pollution from Energy, Consumer electronics, power saving devices, energy from waste, energy use and conservation	**05**

Books Recommended:

Textbooks:

1) Environmental Studies From Crisis to Cure, R. Rajagopalan, 2012
2) Textbook for Environmental Studies For Undergraduate Courses of all Branches of Higher Education, Erach Bharucha
3) Environmental Management Science and Engineering for industry by " Iyyanki V. Murlikrishna and valli Manickam"

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