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)

Fourth Year B. Tech.

in

Electronics & Telecommunication Engineering

(Semester VII)

Revision: 1 (2019)
With effect from the Academic Year: 2022-2023

1st July, 2022

SEMESTER VII

DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)

Scheme for Fourth Year Undergraduate Program in Electronics & Telecommunication Engineering : Semester VII (Autonomous)
(Academic Year 2022-2023)

Semester VII

Sr No	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	DJ19ECC701	Mobile Communication System	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	4
	DJ19ECL701	Mobile Communication System - Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
2	DJ19ECC702	Microwave Engineering	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	4
	DJ19ECL702	Microwave Engineering - Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
3 @	DJ19ECEC7011	Radar Engineering	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	4
	DJ19ECEL7011	Radar Engineering - Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
	DJ19ECEC7012	Big Data Analytics	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ECEL7012	Big Data Analytics - Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
	DJ19ECEC7013	Embedded Systems	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ECEL7013	Embedded Systems- Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
	DJ19ECEC7014	Fundamentals of Speech and Audio Processing	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ECEL7014	Fundamentals of Speech and Audio Processing - Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
	DJ19ECEC7015	Computer Vision	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ECEL7015	Computer Vision - Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
	DJ19ECEC7016	SAS	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ECEL7016	SAS - Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
4#	DJ19ILO7011	Product Lifecycle Management	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	3
	DJ19ILO7012	Management Information System	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ILO7013	Operations Research	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ILO7014	Cyber Security and Laws	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ILO7015	Personal Finance Management	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ILO7016	Energy Audit and Management	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ILO7017	Disaster Management and Mitigation Measures	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ILO7018	Science of Well-being	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ILO7019	Research Methodology	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ILO7020	Public Systems and Policies	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
5	DJ19ECSBL4	IoT and Sensor Network- Laboratory	--	2	--	1	--	--	--	--	--	--	--	--	--	25	25	25	1	2
	DJ19ECSBL5	Industrial Automation - Laboratory	--	2	--	1	--	--	--	--	--	--	--	--	--	25	25	25	1	
6	DJ19ECP701	Project Stage - I	--	4	--	2	--	--	--	--	50	50	--	--	--	50	50	100	2	2
		Total	12	14	--	19	12	300	75	--	50	425	100	100	100	175	275	700	19	

@ Any 1 Elective Course

Any 1 Institute Professional Elective

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

Syllabus for Fourth Year Electronics and Telecommunication Engineering Semester VII (Autonomous)
(Academic Year 2022-2023)

<table>
<tr><td colspan="9">Program: Final Year Electronics and Telecommunication Engineering</td><td colspan="3">Semester: VII</td></tr>
<tr><td colspan="9">Course: Mobile Communication System</td><td colspan="3">Course Code: DJ19ECC701</td></tr>
<tr><td colspan="9">Course: Mobile Communication System - Laboratory</td><td colspan="3">Course Code: DJ19ECL701</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>
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</table>

Pre-requisite:

1. Analog Communication
2. Digital Communication
3. Computer Communication Networks

Objectives:

1. To understand the cellular fundamentals and different types of radio propagation models.
2. To study the system architecture of 2G, 2.5 G and 3G.
3. To develop the concepts of emerging technologies for 4 G standards and beyond.

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

1. Classify different types of propagation models.
2. Explain the cellular fundamentals and estimate the coverage and capacity of cellular systems.
3. Illustrate the fundamentals and system architecture of GSM, 2.5G, IS-95 and UMTS.

4. Elaborate on the concepts and principles 4G network deployment and optimization.
5. Identify the emerging technologies for upcoming mobile communication systems.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Mobile Radio Propagation:** Large scale fading: Free space propagation model, the three basic propagation mechanisms, reflection, ground reflection (two-ray) model. Small scale fading: Small scale multipath propagation, types of small-scale fading, Rayleigh and Ricean distributions.	**05**
2	**Fundamentals of Mobile Communication:** Introduction to wire1ess communication: The Cellular Concept System Design Fundamentals: Frequency Reuse, Handoff, Channel Assignment Strategies, Interference and System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems. Features of all conventional multiple access techniques: Frequency division multiple access (FDMA), Time division multiple access (TDMA), Space spectrum multiple access (SSMA), space division multiple access (SDMA), SCFDMA, OFDM, GFDMA.	**10**
3	**Digital Telephony System(2G and 3G Systems):** GSM: GSM Network architecture, GSM channels, frame structure for GSM, GSM speech coding, authentication and security in GSM, GSM call procedures, GSM hand-off procedures. GSM evolution: GPRS and EDGE- architecture, radio specifications. IS-95: Architecture of CDMA system, CDMA air interface, power control in CDMA system, rake receiver. UMTS: Objectives, evolution path to 3G, network architecture, W-CDMA air interface, attributes of W-CDMA system, Cdma2000 cellular technologies: Forward and Reverse Channels.	**08**
4	**Advanced Techniques for 4G Deployment:** LTE Architecture, Physical layer: Frames, slots, and symbols, modulation, coding, Multi-antenna Techniques: Smart antennas, multiple input multiple output systems Cognitive radio: Architecture, spectrum sensing. Relaying multi-hop and cooperative communications: Principles of relaying, fundamentals SDR: Architecture, limitations, advantages, disadvantages.	**07**

5	**4G Network Planning and Optimization:** Network Elements in a LTE Radio Network , User Equipment (UE), Base Station (eNodeB), Key Phenomena in LTE, Interference in LTE, Scheduling, Quality of Service. Radio Network Planning Process, Pre-Planning Phase, Detailed Network Planning LTE Radio Network Optimisation.	**07**
	Initial Tuning, Cluster Tuning, Market Level/Network Tuning, Self-organizing, Networks, Key Performance Indicators, LTE Advanced, Carrier Aggregation, MIMO Coordinated Multi-point Transmission and Reception (CoMP), Relay Nodes.	
6	**Road map towards 5G:** Introduction to Femtocell, Femtocell Attributes, Femtocell Standards Concept of Femtocells, Types of Femtocells Applications of Femtocells.	**04**

List of Laboratory Experiments: (minimum eight)

1. Study of frequency reuse using Matlab/Scilab
2. To study performance evaluation of handover for absolute signal strength measurement
3. Tutorial based on fundamentals of frequency reuse and capacity of cellular communication system.
4. Implementation of adaptive modulation for wireless environment.
5. Study of Rayleigh and Ricean fading distribution using Simulink and computation of link budget using Okumura model.
6. Tutorial based on emerging technologies of 4G.
7. Tutorial based on 3GPP LTE.
8. Scilab Based GSM, CDMA Implementations
9. Verify use of Orthogonal Walsh codes in CDMA environment
10. Tutorial based on Propagation Models

Books Recommended:

Text books:

1. Theodore S. Rappaport, *Wireless communications - principles and practice*, 2nd Edn, Pearson.
2. T L Singal, *Wireless communications*, 2010, Mc Graw Hill Education.
3. Andreas F. Molisch, *Wireless communications*, 2nd Edn, Wiley India Pvt. Ltd.

Reference books:

1. Upena Dalal, *Wireless and Mobile Communications*, 2009, Oxford University Press.
2. Vijay K.Garg, *Wireless Communications and Networking*, 2007, Morgan–Kaufmann series in Networking-Elsevier.

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 Fourth Year Electronics and Telecommunication Engineering Semester VII (Autonomous)
(Academic Year 2022-2023)

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Pre-requisite:

1. Analog circuit design
2. Electromagnetics and Wave Propagation
3. Radio Frequency Circuit Design
4. Radiating Systems

Objectives:

1. To understand basics of Microwave Communication Systems.
2. To understand various Microwave Devices and Measuring Techniques.

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

1. Analyze propagation through guiding media using Wave equation and design various Impedance Matching Techniques.
2. Analyze functioning of different Microwave components.
3. Analyze Microwave Tubes and derive expressions of necessary performance parameters for them.

4. Implement communication systems using microwave communication bench set-up and software tool.
5. Understand measurement techniques to measure various circuit parameters at microwave frequency and carry out experimental verification for the same.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Basics of Microwave Communication Systems:** Microwave Frequency Bands in Radio Spectrum, Characteristics, Advantages and Applications of Microwaves. Review of Low frequency parameters: Impedance, Admittance, Hybrid and ABCD parameters, Different types of interconnection of Two port networks. High Frequency parameters, Formulation of S- parameters, Properties of S- parameters.	**02**
2	**Waveguides and Impedance matching Network and Passive Devices:** Rectangular waveguides: Construction, Working and Mode analysis and Applications. Circular and Ridge Waveguide: Construction and Applications. Design of Impedance matching network using distributed parameters.	**10**
3	**Passive and Semiconductor Microwave Devices:** Tees, Hybrid ring, Directional couplers, Phase shifters, Terminations, Attenuators and Ferrite devices such as Isolators, Gyrators, and Circulators. Diodes: Varactor, PIN, Tunnel, Point Contact, Schottky Barrier, Gunn, IMPATT. Transistors: BJT, Hetro junction BJT, MESFET, and HEMT *(construction, working, equivalent circuit and performance characteristics).*	**12**
4	**Microwave Generation and Amplification:** Two Cavity Klystron, Multi-Cavity Klystron and Reflex Klystron. Helix Travelling Wave Tube and Cross Field Amplifier. Backward Wave Oscillator, Cylindrical Magnetron and Gyrotron.	**10**
5	**Microwave Measurements:** VSWR, Frequency, Power, Impedance, Attenuation, Dielectric Constant.	**03**

6.	**Microwave Application and Modern Trends in Microwave Engineering:** Effects of Microwave radiation on human body, Microwave hazards. Medical (Microwave Imagining, Microwave Diathermy) and Civil applications (Microwave heating, Instrumentation landing Systems, Radar Navigation Systems) of microwaves.	**03**

List of Laboratory Experiments: (minimum eight)

1. Study of Microwave Components.
2. Measurement of Microwave frequency using Microwave Bench Setup.
3. Measurement of Attenuation using Microwave Bench Set-up.
4. Study of Various Modes of Reflex Klystron.
5. Compare Analytical and Graphical Method of Impedance Matching for Single Stub.
6. Study of Microwave Hazards.
7. Measurement of Wavelength, VSWR and Unknown load using Microwave Bench Set-up.
8. Measurement of S-parameters for various microwave components.
9. Design and Simulation of Branch line coupler.

Books Recommended:

Text books:

1. Samuel Liao, *Microwave Devices and Circuits*, 3rd Edn, Prentice Hall.
2. M. Kulkarni, *Microwave and Radar Engineering*, 3rd Edn, Umesh Publication.

Reference books:

1. D. M. Pozar, *Microwave Engineering*, 4th Edn, Wiley Publications.
2. Annapurna Das, Sisir K. Das, *Microwave engineering*, 3rd Edn, Tata McGraw Hill Publication.
3. Peter A. Rizzi, *Microwave Engineering: Passive Circuits*, 1st Edn, Prentice Hall.

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 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 Fourth Year Electronics and Telecommunication Engineering Semester VII (Autonomous)
(Academic Year 2022-2023)

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</table>

Pre-requisite:

1. Analog Communication
2. Digital Communication
3. Electromagnetics and Wave propagation

Objectives:

1. To interpret Radar range equations
2. To explain different types of Radar
3. To design Radar transmitters and receivers for given conditions

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

1. Understand generalized concept of Radar & its applications.
2. Analyze Radar range equation for various condition.
3. Identify different types of Radar for specific application.
4. Evaluate the design constraints for transmitter and receiver.

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

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Introduction to Radar:** Basic Radar, Radar range equation. Block Diagram, Radar Frequencies. Applications of Radar.	**08**
2	**Radar Equation:** Detection of signal in noise. Receiver Noise and Signal-to-noise Ratio. Probability of detection and false alarm: Simple, complex Targets. Pulse Repetition Frequency.	**08**
3	**MTI and Pulse Doppler Radar :** Introduction to Doppler and MTI radar, Doppler frequency shift. Simple CW Doppler radar, MTI radar block diagram. Delay line canceler. Moving-target-detection. Pulse Doppler radar.	**10**
4	**Tracking Radar:** Mono pulse tracking. Conical scan and sequential lobbing. Limitation of tracking accuracy. Low angle tracking.	**0 6**
5	**Radar Transmitter and Receiver:** Radar RF power sources: Klystron, Travelling wave tube, Magnetron. Low power transmitter, high power transmitter. Advantages of solid state RF power source. Duplexer, and Mixer and their types. Receiver noise figure, Super heterodyne Receiver. Radar Display: Types of displays.	**0 8**

List of Laboratory Experiments: (minimum eight)

1. To study basic Radar and range equation.
2. To Study CW Radar and find the relative speed of the object.
3. Derive Radar range equation with noise figure and find the distance.
4. To study MTI Radar and find the blind speed.
5. Calculate pulse repetition frequency and velocity of the moving object.
6. To study various displays used in Radar systems.
7. To study clutters and its effects on Radar range equation.
8. To study delay line canceller.
9. Find the speed of the fan using Doppler Radar.
10. To study duplexer and mixer.
11. To study tracking Radar.

Books Recommended:

Text Books:

1. Merrill Skolnik, *Introduction to Radar Systems*, 2nd Edn, Tata McGra Hill.
2. G S N Raju , *Radar Engineering*, 1st Edn, Wiley Publication.
3. Bassem R. Mahafza, *Radar Signal Analysis*, 1st Edn, CRC press.

Reference Books:

1. E. David Jansing , *Introduction to Synthetic Aperture Radar*, 2nd Edn, Tata McGra Hill.
2. William L Melvin, James A Scheer, *Principles of Modern Radar*, 2nd Edn, Institution of Engineering and Technology.

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):

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</table>

Pre-requisite:

1. Data Base Management System - Laboratory

Objectives:

1. To Provide an Overview of an exciting growing field of Big Data Analytics.
2. To introduce the tools required to manage and analyze big data like Hadoop, NoSQL, Map Reduce, Spark.
3. To teach the fundamental techniques in achieving big data analytics with scalability and streaming capability.

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

1. Understand the key issues in big data management and its associated applications for business decisions and strategy.
2. Understand and Develop problem solving and critical thinking skills in fundamental enabling techniques like Hadoop and NoSQL in big data analytics.

3. Evaluate Big Data processing by using MapReduce.
4. Interpret business models and scientific computing paradigms and apply software tools for big data analytics.
5. Exploring the capabilities of big data using Apache Spark.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Introduction to Big Data Analytics & Hadoop:** Introduction to Big Data, Big Data characteristics, Types of Big Data, Traditional vs. Big Data business approach. Technologies available for Big Data, Infrastructure for Big Data, Big Data challenges. Case Study of Big Data solutions. Introduction to Hadoop, Core Hadoop components, Hadoop Ecosystem, Physical architecture, Hadoop limitations.	**06**
2	**NoSQL:** Introduction to NoSQL, NoSQL business drivers, NoSQL case studies. NoSQL data architecture patterns: Key-value stores, Graph stores, Column family (Bigtable) stores, Document stores, Variations of NoSQL architectural patterns, Analysing big data with a shared-nothing architecture; Choosing distribution models: master-slave versus peer-to-peer Introduction to MongoDB, MongoDB commands.	**08**
3	**MapReduce:** MapReduce and The New Software Stack: Distributed File Systems, Physical organization of compute Nodes, Large scale file-system organization. MapReduce: The Map tasks, Grouping by key, The Reduce tasks, Combiners, Details of MapReduce execution, Coping with node failures. Matrix vector multiplication using MapReduce, Case studies on MapReduce using Java/Python.	**08**
4	**Techniques in Big Data Analytics:** Finding Similar Item: Nearest Neighbour Search, Similarity of Documents. Mining Data Streams: Data Stream Management Systems, Data Stream Model, Examples of Data Stream Applications: Sensor Networks, Network Traffic Analysis. Link Analysis: PageRank Definition, Structure of the web, dead ends, Using Page rank in a search engine. Frequent Item set Mining: Market Basket Model- Applications, Association Rule- Confidence, Interest, Support, Apriori Algorithm - Pass1, Pass2	**12**

	Recommendation Systems: Introduction, Collaborative-Filtering System, Content based recommendation system.	
5.	**Big Data Analytics using Apache Spark:** Introduction to Spark: Features, Spark built on Hadoop, Components of Spark Resilient Distributed Datasets: Data sharing using Spark RDD, Iterative operations on Spark RDD, Interactive operations on Spark RDD, Spark installation, Core programming, RDD transformations, Execution of word count transformation.	**08**

List of Laboratory Experiments: (minimum eight)

1. Downloading and installing Hadoop; Understanding different Hadoop modes. Startup scripts, Configuration files.
2. Hadoop Implementation of file management tasks.
3. Installation of MongoDB, and execution of CREATE, INSERT, DELETE and UPDATE operations.
4. Querying in MongoDB using FIND command, aggregate functions etc.
5. Execution of PIG SCRIPTING language.
6. Execution of HIVE SCRIPTING language.
7. Execution of Matrix Multiplication Using MapReduce.
8. Execution of Word Count using MapReduce.
9. Execution of Word Count using Apache Spark.
10. Case Study on Recommendation Systems.

Books Recommended:

Text Books:

1. Radha Shankarmani and M Vijayalakshmi, Big *Data Analytics*, 2nd Edn, Wiley Publication.
2. Alex Holmes, *Hadoop in Practice*, 2012, Manning Press, Dreamtech Press.
3. Dan McCreary and Ann Kelly, *Making Sense of NoSQL – A guide for managers and the rest of us*, 2013, Manning Press.
4. Andy Konwinski, Matei Zaharia, Holden Karau, *Learning Spark*, 2015, O'Reilly Media, Inc.

Reference Books:

1. Bill Franks, Taming, The *Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analytics*, 2012, Wiley Publication.

2. Chuck Lam, *Hadoop in Action*, 2010, Dreamtech Press.
3. Bill Chambers, Matei Zaharia, Spark*: The Definitive Guide*, 2018, O'Reilly Media, Inc.

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 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 Fourth Year Electronics and Telecommunication Engineering Semester VII (Autonomous)
(Academic Year 2022-2023)

<table>
<tr><td colspan="8">Program: Fourth Year Electronics and Telecommunication Engineering</td><td colspan="3">Semester: VII</td></tr>
<tr><td colspan="8">Course: Embedded Systems</td><td colspan="3">Course Code:DJ19ECEC7013</td></tr>
<tr><td colspan="8">Course: Embedded Systems - Laboratory</td><td colspan="3">Course Code: DJ19ECEL7013</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme
(Hours / week)</td><td colspan="7">Evaluation Scheme</td></tr>
<tr><td colspan="4">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="4">Theory</td><td>Term Test 1</td><td>Term Test 2</td><td>Avg.</td></tr>
<tr><td colspan="4">75</td><td>25</td><td>25</td><td>25</td><td>100</td></tr>
<tr><td colspan="4">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 Work</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. Digital System Design
2. Integrated Circuit
3. Microprocessor & Microcontroller

Objectives:

1. To develop background knowledge of Embedded Systems.
2. To understand Embedded Systems communication techniques.
3. To write programs for Embedded Systems and Real Time Operating Systems.

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

1. Describe the Embedded System characteristics, design metrics and development life cycle.
2. Discuss different processor design techniques and architectures with example.
3. Identify different communication types and buses with different protocols.

4. Describe concepts and components of Real Time Operating system.
5. Gain ability to work in teams to solve complex problems and communicate effectively with technical reports / writeups.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Embedded System Overview:** Definition of Embedded System, Embedded Systems vs General Computing Systems, Classification, Major Application Areas, Characteristics and quality attributes (Design Metric) of embedded system. Real time system's requirements, real time issues, interrupt latency. Embedded Product development life cycle.	**06**
2	**Processor:** Overview of Custom Single-Purpose Processors, General-Purpose Processors, Standard Single-Purpose Processors, RISC and CISC architectures, GCD example.	**08**
3	**Communication:** CAN bus, I2C, MOD bus, SPI, Examples on Parallel Communication, Serial Communication, Wireless Communication.	**06**
4	**Real Time Operating Systems (RTOS):** Operating system basics, Types of OS, Tasks, process, Threads, Multiprocessing and, Multitasking, Task scheduling, Threads, Process, Scheduling.	**06**
5	**Real Time Operating Systems (RTOS):** Task communications, Task synchronization, Device drivers, How to choose RTOS, Examples of RTOS.	**06**
6.	**Design examples and case studies of program model and programming with RTOS:** Digital Camera, Introduction to simple digital camera, Requirements and specifications, Design using Microcontroller and Microcontroller and CCDPP, Automatic Chocolate Vending Machine, Adaptive Cruise Control in car.	**08**

List of Laboratory Experiments: (minimum eight)

1. Interfacing of I2C, CAN, SPI, ZigBee etc. with ARM.
2. Speed Control of DC Motor using ARM.
3. Simulation of multitasking using RTOS.

4. Simulation of mutex using RTOS.
5. Simulation of mailboxes using RTOS.
6. Inter process communication using semaphore in RTOS.
7. Simulation of message queues using RTOS.
8. Simulate the scheduling algorithms.
9. Mini Project.

Books Recommended:

Text Books:

1. Frank Vahid and Tony Givargis, *Embedded System Design: A Unified Hardware/Software Introduction,* 3rd Edn, Wiley Publication.
2. Raj Kamal, *Embedded Systems: Architecture, Programming and Design,* 3rd Edn, Tata McGraw-Hill Publication.
3. Sriram Iyer and Pankaj Gupta, *Embedded Real-time Systems Programming,* 1st Edn, Tata McGraw-Hill Publication.

Reference Books:

1. David Simon, *An Embedded Software Primer,* 1st Edn, Pearson Publication.
2. K.V. Shibu, *Introduction to Embedded Systems*, 2nd Edn, McGraw Hill.
3. K.V.K. Prasad, *Embedded Systems / Real-Time Systems: Concepts, Design & Programming,* 1st Edn, Dreamtech 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 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.

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, 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 Fourth Year Electronics and Telecommunication Engineering Semester VII (Autonomous)
(Academic Year 2022-2023)

Program: Fourth Year Electronics and Telecommunication Engineering	**Semester: VII**
Course: Fundamentals of Speech and Audio Processing	**Course Code: DJ19ECEC7014**
Course: Fundamentals of Speech and Audio Processing - Laboratory	**Course Code: DJ19ECEL7014**

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. Signals and Systems
2. Digital Signal Processing

Objectives:

1. To understand basic concepts and methodologies for the analysis and modeling of speech signal.
2. To characterize the speech signal as generated by a speech production model.
3. To understand the mechanism of speech and audio perception.
4. To understand the digital representation of the speech waveform.
5. To perform the analysis of speech signal using STFT.

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

1. Demonstrate advanced Knowledge in Digital model representation of speech signal.
2. Design and implement algorithms for processing speech and audio signals considering the properties of acoustic signals and human hearing.
3. Analyse speech signal to extract the characteristic of vocal tract (formants) and vocal cords (pitch).
4. Formulate and design a system for speech recognition and speaker recognition.
5. Acquired knowledge about audio and speech signal estimation and detection.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Digital Representations of the Audio Waveform:** Sampling audio signals, Instantaneous quantization, Adaptive quantization, Differential quantization, Delta Modulation.	**05**
2	**Digital Models for Speech signals:** Speech Production, Acoustic Phonetics and Auditory Perception, Anatomy and physiology of speech organs, articulatory phonetics, acoustic phonetics, acoustic theory of speech production, discrete time model for speech production. Ear physiology	**05**
3	**Time dependent processing of speech signals:** Short time energy and average magnitude, Short time average zero crossing rate, Speech V/S silence discrimination using energy & Zero crossings, Pitch period estimation, Short time autocorrelation function, Short time average magnitude difference function, Pitch period estimation using autocorrelation function, Median smoothing. Pitch period estimation based on FFT and harmonic peak detection method, estimation of formants using log spectrum.	**08**
4	**Short time Fourier Transform:** Introduction- Definition and Properties, Fourier Transform Interpretation ,Linear Filtering Interpretation, Sampling rates of $X_n(e^{jw})$ in Time and Frequency, Filter Bank Summation Method of Short -Time Synthesis, Overlap Addition Method for Short -Time Synthesis.	**08**
5	**Homomorphic Processing:** Cepstral analysis of speech, mel frequency cepstral coefficients (MFCC), perceptual linear prediction (PLP), Pitch period estimation in cepstral domain, evaluation of formants using cepstrum.	**08**
6	**LPC and Parametric Speech Coding:** Review of lattice structure realization, forward and backward error filters, normal equations & its solutions, levinson-durbin algorithm, Berg's algorithm. Vocoder- Voice excited channel vocoder, Voice excited and error signal excited LPC vocoders , code excited LP (CELP) based vocoders, Adaptive predictive coding of speech, Auditory Modeling. Audio quality analysis: Objective analysis methods- PEAQ, Subjective analysis methods - MOS score. Speech Recognition using Dynamic Time Warping and Hidden Markov Models.	**10**

List of Laboratory Experiments: (minimum eight)

1. To record the name of student in Praat and plot its spectrogram.
2. Plot a vowel file 'a' and its Welch power spectral density estimate.
3. To calculate positive and negative ZCR for a voiced and unvoiced speech segment.
4. A program to find pitch period using method of autocorrelation.
5. A MATLAB program to find pitch frequency using spectrum method for unvoiced segment.
6. Program for finding cepstrum of speech segment.
7. To find formants using power spectrum estimate using Welch method and method of periodograms for voiced segment of speech.
8. A program to use Homomorphic processing and extract the impulse response of the vocal tract.
9. Program to convert frequency to Mel scale.
10. To find LPC and reflection coefficients using Levinson Durbin algorithm.

Books Recommended:

Text Books:

1. Rabiner and Schafer, *Digital Processing of Speech Signals*, Pearson Education, 2004.
2. Shaila D. Apte, *Speech and Audio Processing*, Wiley India, 2012.
3. Douglas O'Shaughnessy, *Speech Communications: Human & Machine*‖, 2nd Edn, Universities Press.
4. Thomas F. Quatieri, *Discrete-Time Speech Signal Processing: Principles and Practice*, 2001, Prentice Hall.
5. J. L. Flanagan, *Speech Analysis Synthesis and Perception*, 2nd Edn, Springer Verlag.

Reference Books:

1. Ben Gold and Nelson Morgan, *Speech and Audio Signal Processing*, Wiley India (P) Ltd, 2006.
2. L. R. Rabiner, B. H. Juang, B. Yegnanarayana, *Fundamentals of speech Recognition*, Pearson Education, 1993.

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, and an 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, 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 Fourth Year Electronics and Telecommunication Engineering Semester VII (Autonomous)
(Academic Year 2022-2023)

<table>
<tr><td colspan="8">Program: Fourth Year Electronics and Telecommunication Engineering</td><td colspan="3">Semester: VII</td></tr>
<tr><td colspan="8">Course: Computer Vision</td><td colspan="3">Course Code: DJ19ECEC7015</td></tr>
<tr><td colspan="8">Course: Computer Vision - Laboratory</td><td colspan="3">Course Code: DJ19ECEL7015</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme (Hours / week)</td><td colspan="7">Evaluation Scheme</td></tr>
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</table>

Pre-requisite:

1: Applied Mathematics IV

2: Fundamentals of Digital Image Processing

Objectives:

1. Exemplify fundamental concepts related to multidimensional signal processing , feature extraction, pattern analysis and clustering.
2. Obtain and process image data and relate it to 3D scene structures.
3. Familiarize with the necessary tools of Computer Vision such as OpenCV, Matlab, and Python etc.

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

1. Apply computer vision algorithms to edge detection, motion and object recognition.
2. Recognize geometrical relationships between 2D and 3D world.
3. Design and develop practical and innovative Image Processing and Computer Vision applications or systems.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Segmentation –I:** Edge Detection: - Canny, A model fitting method for edge detection – RANSAC LOG, DOG. Lines-Hough Transform, Image Pyramids and Gaussian derivative filters.	**07**
2	**Segmentation –II:** Key Point Localization, Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH	**08**
3	**Precursor:** Transformation Matrices – Homogeneous coordinates – Translation, Rotation Camera Models: Intrinsic and Extrinsic Camera Parameters, Homogeneous Coordinates, Perspective Projection Transformation,3-D Rotation of Points, Camera Calibration, Properties of Projection, Orthographic and Weak Perspective Projection.	**09**
4	**Optical Flow:** Computations for motion estimation and depth calculation, Horn and Schunk, Lucas and Kanade algorithms, Motion Segmentation. Convolution Neural Networks: Design and Implementation.	**08**
5	**Clustering Solutions for Segmentation:** Agglomerative Hierarchical Clustering – Algorithm, K-means Clustering, PCA and Eigenfaces, Linear Discriminant Analysis and Fisherfaces,	**08**

Books Recommended:

Text Books:

1. Richard Szeliski, *Computer Vision: Algorithms and Applications*, Springer-Verlag London Limited 2011.
2. D. A. Forsyth, J. Ponce, *Computer Vision: A Modern Approach*, Pearson Education 2003.
3. R.C. Gonzalez and R.E. Woods, *Digital Image Processing*, Addison- Wesley 1992.

Reference Books:

1. O. Marques, *Practical Image and Video Processing using Matlab*, IEEE Press, Wiley, 2011.
2. K. Fukunaga, *Introduction to Statistical Pattern Recognition*, 2nd Edn, Academic Press, Morgan Kaufmann.

List of Laboratory Experiments: (minimum eight)

1. Implementation of Viola Jones Algorithm for face recognition.
2. Segmentation of Images using Canny Edge Detector.
3. Segmentation of Image using k-means algorithm.
4. Optical Flow with Lucas-Kanade method.

5. Image Compression using Principal Component Analysis.
6. Corner Detection using the Harris Corner Detector.
7. Implementation of ALEXNET or RESNET architectures for any desired application.
8. Segmentation based on Image Texture.
9. Tensor Flow: Introduction (any one application).
10. Transformer: Introduction (any one application).

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

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, 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 Fourth Year Electronics and Telecommunication Engineering Semester VII (Autonomous)
(Academic Year 2022-2023)

Program: Fourth Year B. Tech. in Electronics & Telecommunication Engineering	**Semester: VII**
Course: SAS	**Course Code: DJ19ECEC7016**
Course: SAS Laboratory	**Course Code: DJ19ECEL7016**

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**	**-**	**4**	**Oral**	**Practical**	**Oral &Practical**	**Laboratory Work**	**Tutorial / Mini project / presentation/ Journal**		
				25	-	-	**15**	**10**	**25**	

Pre-requisite: Basic statistics and Database

Course Objectives: Students will try to:

1. Business Analytics refers to skills, practices and techniques used in converting data into information and knowledge that aid business decision making.
2. Statistical learning including quantitative, qualitative analysis techniques
3. The use of the above analysis and visualization to aid decision making.

Outcomes: Students will be able to

1. Able to familiar with Base SAS programming.
2. Understand and demonstrate visual analytics.
3. Able to design the report using reporter
4. View various reports using different media devices.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Introduction to Base SAS:** **SAS Program :** Introduction to SAS program, Submitting a SAS program – SAS Studio, SAS Enterprise Guide, SAS Windowing environment, SAS program syntax **Accessing Data :**Examining SAS Data sets, Accessing SAS Libraries **Producing Detail Reports:** Subsetting Report data, Sorting and Grouping Report data, Enhancing Reports **Formatting Data Values:** Using SAS Formats, User defined Formats	08
2	**Reading SAS Dataset , Spreadsheet and Database data** Reading SAS Dataset. Customize SAS Dataset. Router Reading Spreadsheet data Reading database data.	05
3	**Visual Analytics** Getting Stated with SAS Visual Analytics: Exploring SAS VA concepts, Using Home page Administrating the Environment and Managing Data: Exploring Data Builder, Exploring Administrator. Demonstrations and Exercises.	04
4	**Using the Explorer** Selecting Data and defining Data Item properties Creating Visualisations, Enhancing Visualisations with Analytics Interacting with Visualizations and Explorations	08
5	**Designing Reports with Reporter** Creating a Simple Report Creating Data Items and Working with Graphs Working with Filters and Report sections Working with other objects Demonstrations and Exercises	08

6	**Viewing SAS VA Reports and Case Study** Creating Analyses and Reports. Viewing Reports on the Web Viewing Reports on the Mobile Device/ Office Analytics Case Study – Creating Analyses and Reports	06

Books Recommended:

1. SAS programming 1 – Essentials.
2. SAS Visual Analytics – Fast Track.
3. SAS Support

Suggested List of Experiments:

Sr. No.	Title of the Experiment
1.	Importing data in SAS from Excel and CSV file.
2.	Creating summary statistical data.
3.	Exporting results to Excel and PDF.
4.	Manipulating data with functions.
5.	Using data with formats like charts and graphs.
6.	Creating data by applying filters and performing data analysis on it.
7.	Working with graph level display rules.
8.	Analyzing a Text data source.

Evaluation Scheme:

Semester End Examination (A):

Theory:

1. Question paper based on the entire syllabus, 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 the two tests will be considered for final grading.

Laboratory: (Term work)

Laboratory work will be based on **DJ19CEEL6013** with minimum 06 experiments along with a mini project to be incorporated.

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

1. Laboratory work (Performance of Experiments): 15 Marks
2. Journal Documentation (Write-up 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 Fourth Year Electronics and Telecommunication Engineering Semester VII (Autonomous)
(Academic Year 2022-2023)

<table>
<tr><td colspan="8">Program: Fourth Year Electronics and Telecommunication Engineering</td><td colspan="3">Semester: VII</td></tr>
<tr><td colspan="8">Course: IoT and Sensor Network - Laboratory</td><td colspan="3">Course Code: DJ19ECSBL4</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme (Hours / week)</td><td colspan="7">Evaluation Scheme</td></tr>
<tr><td colspan="4">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="4">Theory</td><td>Term Test 1</td><td>Term Test 2</td><td>Avg.</td></tr>
<tr><td colspan="4">--</td><td>--</td><td>--</td><td>--</td><td>--</td></tr>
<tr><td colspan="4">Laboratory Examination</td><td colspan="3">Term work</td><td rowspan="3">Total Term work</td><td rowspan="3">25</td></tr>
<tr><td rowspan="2">--</td><td rowspan="2">2</td><td rowspan="2">--</td><td rowspan="2">1</td><td>Oral</td><td>Practical</td><td>Oral & Practical</td><td>Laboratory Work</td><td>Tutorial / Mini project / presentation/ Journal</td></tr>
<tr><td>--</td><td>--</td><td>--</td><td>15</td><td>10</td><td>25</td></tr>
</table>

Pre-requisite:

1. Basic Electrical & Electronics
2. Electronics Measurement and Instruments
3. Microprocessor & Microcontroller
4. Embedded Systems

Objectives:

1. To learn IoT and Sensor Network systems.
2. To learn IoT and Sensor Network techniques.
3. To Analyze IoT in terms of a suggested IoT conceptual framework.
4. To learn initiatives of international organizations for design standardization of IoT/M2M architectural layers and domains.
5. To provide working experience in various Hardware / Software programming techniques.

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

1. Identify different components of an IoT and Sensor network system.
2. Designing and affordability of IoT devices.
3. To explore the Industrial IoT, Industry 4.0, Connected Car applications.
4. Use Internet of Things for real time applications.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Introduction:** Internet of Things an overview, IoT Conceptual framework, IoT architectural View, Technology behind IoT, Sources of IoT, M2M Communication, Examples of IoT.	**02**
2	**Design Principles for Connected Devices:** IoT/M2M systems Designs Standardization, Communication Technologies, Data Enrichment, Data Consolidation, and device management, Designing and affordability, Energy efficiency in IoT.	**02**
3	**Design Principles for Web Connectivity:** Introduction, Web communication protocol for connected devices, Message communication protocols for connected devices, Internet based communication, IP addressing in the IoT.	**03**
4	**Data Acquiring, Organizing, Processing and Analytics:** Data acquiring and storage, Organizing the data, Transactions, Integration and Enterprise systems, Acquiring, Managing and storing processes.	**03**
5	**Sensors, Participatory Sensing, RFIDs, and Wireless Sensor Networks:** Sensor technology, Industrial IoT and Automotive IoT, Actuator, Sensor data communication protocols, Wireless sensor networks technology, Embedded Computing Basics, Embedded Platforms for prototyping.	**04**

List of Laboratory Experiments: (minimum eight)

1. LED Blink and Pattern.
2. 7 Segment Display.
3. Push Button.
4. LED Pattern with Push Button Control.
5. Push Button Counter.
6. LM35 Temperature Sensor.
7. Analog Inputs.
8. Analog Input & Digital Output
9. IR Sensor Analog Input.
10. LCD 16X2 Display.
11. IR Sensor Based Security System.

12. Night Light Controlled & Monitoring System.
13. Analog Input & Analog Output.
14. LM35 Temperature Sensor with Fire Alarm.

Books Recommended:

Textbooks:

1. Raj Kamal, *Internet of Things Architecture and Design Principles*, Tata McGraw Hill, 2017.
2. Colin Dow, *Internet of Things Programming Projects: Build modern IoT solutions with the Raspberry Pi 3 and Python*, 2018, Packt Publishing.
3. Constandinos X. Mavromoustakis, George Mastorakis, Jordi Mongay Batalla, *Internet of Things (IoT) in 5G Mobile Technologies*, 2016, Springer International Publication.

Reference Books:

1. Fadi Al-Turjman , *Artificial Intelligence in IoT*, 1st Edn, Springer International Publishing.
2. Shampa Sen, Leonid Datta, Sayak Mitra, *Machine Learning and IoT: A Biological Perspective*, 2019 CRC Press.
3. Anand Tamboli, *Build Your Own IoT Platform: Develop a Fully Flexible and Scalable Internet of Things Platform in 24 Hours*, 2019 Apress.

Evaluation Scheme:

Semester End Examination (A):

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 Fourth Year Electronics and Telecommunication Engineering Semester VII (Autonomous)
(Academic Year 2022-2023)

Program: Fourth Year Electronics and Telecommunication Engineering	**Semester: VII**
Course: Industrial Automation - Laboratory	**Course Code: DJ19ECSBL5**

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.**	
				--			--	--	--	--
				Laboratory Examination			**Term work**		**Total Term work**	**25**
--	**2**	--	**1**	**Oral**	**Practical**	**Oral & Practical**	**Laboratory Work**	**Tutorial / Mini project / presentation/ Journal**		
				--	--	--	**15**	**10**	**25**	

Pre-requisite:

1. Basic Electrical &Electronics
2. Digital System Designs
3. Electronics Measurement and Instruments
4. Control Systems
5. Microprocessor & Microcontroller

Objectives:

1. To learn Industrial automation and various systems.
2. To learn Industrial automation techniques.
3. To identify the differences between PLCs, SCADA, DCS.
4. To provide the skills to install and trouble shoot Automation systems.
5. To provide working experience in various programming techniques.

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

1. Identify different components of an automation system.
2. Interface the given I/O device with appropriate PLC module.
3. Prepare PLC ladder program for the given application
4. Prepare a simple SCADA application.
5. Use Internet of Things for industrial automation

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Introduction:** Need and benefits of Industrial Automation, Basic components of automation system, Types of automation, Fixed, Programmable, Flexible, Different systems used for Automation i.e. PLC, HMI, SCADA, DCS, Drives.	**04**
2	**Programmable Logic Controller (PLC):** Introduction, Block diagram, memory organization, IO modules (discrete and Analog), I/O modules selection criteria, Fixed and Modular PLC, PLC selection, PLC Installation, Advantage, Application.	**06**
3	**PLC Programming:** I/O addressing, Programming instructions (Relay, Timer, Counter, Delay, Logical, Data Handling, Comparison), Functional Block Diagram (FBD), Ladder Programming.	**06**
4	**Supervisory Control and Data Acquisition System (SCADA):** Introduction, Architecture/Block diagram, editors of SCADA, Interface SCADA with PLC, create SCADA screen for simple object, Application of SCADA like Traffic light control, water distribution, Industrial PCs, Mini Rugged PCs, Industrial Open Frame Panel PCs.	**06**
5	**Distributed Control System (DCS):** Overview of DCS, DCS software configuration, DCS communication, DCS Supervisory Computer Tasks, DCS integration with PLC and Computers, Advantages of DCS.	**04**

List of Laboratory Experiments: (minimum eight)

1. Develop/Execute ladder diagram using timer, counter, logical and arithmetic instructions.
2. Use PLC to control the devices, lamp, motor switches, sensors
3. Measure Temperature of the given liquid using RTD or Thermocouple and PLC.
4. Design ladder diagram for Blink LEDs
5. Design ladder diagram for sequential control of DC motor.
6. Develop and test ladder program for pulse counting using switch/ proximity sensor.
7. Use various functions of SCADA simulation editors to develop simple project.
8. Develop SCADA mimic diagram for water tank level control.
9. Industrial PC based control system.
10. Identify various automation systems available in different appliances/devices/machines in day-to-day use.
11. Identify various parts and front panel status indications of the given PLC.

Books Recommended:

Text Books:

1. Petruzella F. D, *Programmable Logic Controller*, 4th Edn, Tata McGraw Hill.
2. Mitra Madhuchandra, Sengupta , *Programmable logic controller and industrial automation*, 5th Edn, Penram International Publication.
3. Bhoyar S A, *Supervisory control & Data acquisition*, 4th Edn, ISA Publication.
4. Stenerson John, *Industrial Automation & Process Control*, 1st Edn, Pearson Publication.

Reference Books:

1. S.K. Singh, *Industrial Instrumentation and Control*, 2nd Edn, Tata McGraw Hill.
2. Richard L. Shell, *Handbook of Industrial Automation*, 1st Edn, CRC Press.
3. Bailey, David, *Practical SCADA for Industry*, 1st Edn, Newnes international Publication.

Evaluation Scheme:

Continuous Assessment (A):

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 Fourth Year Electronics and Telecommunication Engineering Semester VII (Autonomous)
(Academic Year 2022-2023)

<table>
<tr><td colspan="8">Program: Fourth Year Electronics and Telecommunication Engineering</td><td colspan="3">Semester: VII</td></tr>
<tr><td colspan="8">Course: Project Stage - I</td><td colspan="3">Course Code: DJ19ECP701</td></tr>
<tr><td colspan="4" rowspan="3">Teaching Scheme
(Hours / week)</td><td colspan="7">Evaluation Scheme</td></tr>
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<tr><td>--</td><td>--</td><td>50</td><td>--</td><td>--</td><td>50</td></tr>
</table>

Objectives:

1. To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
2. To train the students in preparing project reports and to face reviews and viva voce examination.

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

1. Apply the technical knowledge gained from previous courses, Identify problems and design solutions to solve real-life problems.
2. Apply project management skills (scheduling work, procuring parts, documenting technical and non-technical details and working within the confined deadline).
3. Create technical reports, research paper and present the same to the evaluation authorities

In final year group of maximum four students will be completing a comprehensive project work based on the courses studied. The project work may be internally assigned or may be externally assigned by the research institutes, industry etc. Each group will be assigned one faculty as a supervisor. This project work in final year may be extension of the Innovative Product Development (DJ STRIKE) Project work done in pre-final year.

The main intention of Project work is to enable students to apply the knowledge and skills learned out of courses studied to solve/implement predefined practical problem. The Project work may be beyond the scope of curriculum of courses taken or may be based on the courses but thrust should be

- Learning additional skills
- Development of ability to define, design, analysis and implementation of the problem and lead to its accomplishment with proper planning
- Learn the behavioural science by working in a group
- The project area may be selected in which the student intend to do further education and/or may be either intend to have employment or self-employment
- The topic of project should be different and / or may be advancement in the same topic of Innovative Product Development (DJ STRIKE) project
- The students may use this opportunity to learn different computational techniques as well as some model development. This they can achieve by making proper selection of Project work.

Evaluation Scheme:

Semester End Examination (A):

Oral & Practical:

An approved external examiner and internal examiner appointed by the head of the institute together will assess during oral examination. The oral examination is a presentation by the group members on the project along with demonstration of the work done. In the examination each individual student should be assessed for his/her contribution, understanding and knowledge gained.

Continuous Assessment (B):

Termwork:

The college should keep proper assessment record of the progress of project and at the end of the semester it should be assessed for awarding TW marks. The TW should be examined by approved internal faculty appointed by the head of the institute on the basis of following:

- Scope and objective of the project work
- Extensive Literature survey
- Progress of the work (Continuous assessment)
- Report in prescribed format

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

Prepared by Checked by Head of the Department Principal