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)

Third Year B.Tech

in

Electronics Engineering

(Semester V and VI)

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

1st July, 2021

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

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 (TT 1)	Term Test 2 (TT 2)	Avg (TT 1 & TT 2)	Term Work Total	CA Total (B)			
1	DJ19ELXC501	Power Electronics	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	**4**
	DJ19ELXL501	Power Electronics Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
2	DJ19ELXC502	Design with Linear Integrated Circuits	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	**4**
	DJ19ELXL502	Design with Linear Integrated Circuits Laboratory	--	2	--	1	--	--	--	--	25	25	--	--	--	25	25	50	1	
3	DJ19ELXC503	Microprocessors and Microcontrollers	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	**4**
	DJ19ELXL503	Microprocessors and Microcontrollers Laboratory	--	2	--	1	--	--	--	--	25	25	--	--	--	25	25	50	1	
4@	DJ19ELEC5011	Advanced Control Systems	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	**4**
	DJ19ELEL5011	Advanced Control Systems Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
	DJ19ELEC5012	Data Structures and Algorithms	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ELEL5012	Data Structures and Algorithms Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
	DJ19ELEC5013	Antennas and Wave Propagation	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	
	DJ19ELEL5013	Antennas and Wave Propagation Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	
5	DJ19ELXSBL1	Skill based Course - I Laboratory	--	4	--	2	--	--	--	--	25	25	--	--	--	50	50	75	2	**2**
6#	DJ19IHL2	Professional and Business Communication Laboratory	--	4	--	2	--	--	--	--	--	--	--	--	--	50	50	50	2	**2**
7	DJ19ILL1	Innovative Product Development - III	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1	**1**
		Total	**12**	**18**	**0**	**21**	--	**300**	**75**	--	**75**	**450**	**100**	**100**	**100**	**225**	**325**	**775**	**21**	

@ - Any 1 Elective Course

- 2 hrs. of theory (class wise) and 2 hrs. of activity based laboratory (batch wise)

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

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	DJ19ELXC601	Embedded Systems and RTOS	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	**4**	
	DJ19ELXL601	Embedded Systems and RTOS Laboratory	--	2	--	1	--	--	--	--	25	25	--	--	--	25	25	50	1		
2	DJ19ELXC602	Digital Signal Processing	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	**4**	
	DJ19ELXL602	Digital Signal Processing Laboratory	--	2	--	1	--	--	--	--	25	25	--	--	--	25	25	50	1		
3	DJ19ELXC603	VLSI Design	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	**4**	
	DJ19ELXL603	VLSI Design Laboratory	--	2	--	1	--	--	--	--	25	25	--	--	--	25	25	50	1		
4@	DJ19ELEC6021	Advanced Power Electronics	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3	**4**	
	DJ19ELEL6021	Advanced Power Electronics Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1		
	DJ19ELEC6022	Operating Systems	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3		
	DJ19ELEL6022	Operating Systems Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1		
	DJ19ELEC6023	Mobile Communication	3	--	--	3	3	75	--	--	--	75	25	25	25	--	25	100	3		
	DJ19ELEL6023	Mobile Communication Laboratory	--	2	--	1	--	--	25	--	--	25	--	--	--	25	25	50	1		
5	DJ19ELXSBL2	Skill based Course - II Laboratory	--	4	--	2	--	--	--	--	25	25	--	--	--	50	50	75	2	**2**	
6	DJ19ILL2	Innovative Product Development - IV	--	2	--	1	2	--	--	--	25	25	--	--	--	25	25	50	1	**1**	
7	DJ19A5	Environmental Studies	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
		Total	**13**	**14**	**--**	**19**	**--**	**300**	**25**	**--**	**125**	**450**	**100**	**100**	**100**	**175**	**275**	**725**	**19**		

@ - Any 1 Elective Course

- 2 hrs. of theory (class wise) and 2 hrs. of activity-based laboratory (batch wise)

Syllabus for TY B.Tech. (Electronics Engineering) - Semester V (Autonomous)

Program: Third Year Electronics Engineering	Semester: V
Course: Power Electronics	Course Code: DJ19ELXC501
Course: Power Electronics Laboratory	Course Code: DJ19ELXL501

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

Pre-requisite courses:

- DJ19ELXC302: Electronic Devices and Circuits
- DJ19ELXC303: Electrical Networks & Synthesis

Objectives:

1. To teach power electronic devices and their characteristics.
2. To highlight power electronics based rectifiers, inverters and choppers.

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

1. Differentiate and Design lower power & higher power applications & their control elements
2. Compute, Design and Analyse Triggering, Commutation and Protection Mechanisms for power devices.
3. Compute & Analyse performance parameters for controlled rectifiers, inverters & voltage controllers.
4. Simulate and Design various applications in daily usage – SMPS, UPS, Induction Heating, Speed & Illumination Control.

Detailed Syllabus: (unit wise)

Unit	Description	Duration
1	**Power semiconductor devices** **1.1 Principle** of operation of SCR, static and dynamic characteristics, gate Characteristics, **1.2** Principle of operation, characteristics, ratings and applications of: TRIAC, DIAC, Power MOSFET and power BJT. IGBT: basic structure, principle of operation, equivalent circuit, latch-up in IGBT's and V-I characteristics.	07
2	**Triggering, Commutation and Protection Circuits** **2.1 Methods** of turning ON Thyristors (types of gate signal), firing circuits (using R, RC, UJT, Ramp and pedestal, inverse cosine),	08

	2.2 Design of commutation circuits – Class A – Class E Commutation **2.3** Protection of Thyristors – Snubber Circuits, Fuse, MCCB, Gate Protection, Crowbar Protection\	
3	**Single-phase Controlled Rectifiers** **3.1** Introduction to uncontrolled rectifiers, half wave controlled rectifiers with R, RL load, effect of free-wheeling diode **3.2** Full wave fully controlled rectifiers (centre-tapped, bridge configurations), full-wave half controlled (semi-converters) with R, RL load, effect of freewheeling diode and effect of source inductance. Calculation of performance parameters	**07**
4	**Inverters** **4.1** Introduction to basic and improved series & parallel inverters **4.2** Introduction, principle of operation, performance parameters of Single phase half / full bridge voltage source inverters with R and R-L load, **4.3** PWM Inverters & Harmonic neutralization in PWM Inverters	**08**
5	**DC-DC converters** **5.1** Basic principle of step up and step down DC-DC converters – Class A- Class E (Single Quadrant – 4 Quadrant Chopper) **5.2** Voltage commutated, current commutated and load commutated DC-DC converters	**07**
6	**AC Voltage Controllers and Cycloconvertors** **6.1** Principles of On-Off control, principle of phase control, single phase bidirectional control with R and RL load **6.2** Introduction to single phase Cycloconverters & applications	**05**
	Total hours	**42**

List of Laboratory Experiments:
Suggested experiments: (Any Eight)

1. Characteristics of SCR, DIAC, TRAIC.
2. Characteristics of IGBT, MOSFET and Power BJT.
3. Firing circuit for SCR using UJT.
4. Study of Half wave and Full wave rectifiers using diodes.
5. Study of Half wave and Full wave controlled rectifiers.
6. Buck converter, Boost converter and Buck-Boost converter.
7. Study of Cycloconverter.
8. Simulation of single phase half wave and Full wave rectifier circuit.
9. Simulation of controlled rectifier with R and RL load.
10. Simulation of controlled rectifier with (i) Source Inductance (ii) Freewheeling diode.
11. Solar Panel I – V characteristics under various illumination conditions.
12. Solar Panel – Maximum Power Operating Point.

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

Books Recommended:

Text books:

1. P. S. Bhimbra, "Power Electronics", Khanna Publishers, 2012
2. M.D. Singh and K. B. Khanchandani, "*Power Electronics*", Tata McGraw Hill

Reference Books:

1. M. H. Rashid, "*Power Electronics*", Prentice-Hall of India
2. Ned Mohan, "*Power Electronics*", Undeland, Robbins, John Wiley Publication
3. Ramamurthy, "*Thyristors and Their Applications*"
4. P. C. Sen, "*Modern Power Electronics*", Wheeler Publication

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:

Oral examination of 25 marks 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 the two tests will be considered for final grading.

Term work:

Term work shall consist of minimum 8 experiments 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, and Assignments):	10 Marks
	Total:	**25 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 TY B.Tech. (Electronics Engineering) - Semester V (Autonomous)

Program: Third Year Electronics Engineering	Semester : V
Course : Design with Linear Integrated Circuits	Course Code : DJ19ELXC502
Course : Design with Linear Integrated Circuits Laboratory	Course Code : DJ19ELXL502

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 courses:

- DJ19ELXC302: Electronic Devices and Circuits - I
- DJ19ELXC402: Electronic Devices and Circuits - II

Objective:

1. To teach fundamental principles of standard linear integrated circuits.
2. To develop an overall approach for students from selection of integrated circuit, study its specification, the functionality, design and practical applications.

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

1. Demonstrate an understanding of fundamentals of integrated circuits.
2. Analyze the various applications and circuits based on particular linear integrated circuit.
3. Select and use an appropriate integrated circuit to build a given application.
4. Design an application with the use of integrated circuit

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Fundamentals of Operational Amplifier** **1.1** Ideal Op Amp, characteristics of op-amp, op-amp parameters, **1.2** Operational amplifier open loop and closed loop configurations, Inverting and non-inverting amplifier	**03**
2	**Applications of Operational Amplifier** **2.1** Amplifiers: Adder, subtractor, integrator, differentiator, current amplifier, difference amplifier, instrumentation amplifier, types of Filters -low pass, high pass and band pass filter and effects of 1^{st} & 2^{nd} order system. **2.2** Converters: Current to voltage converters, voltage to current converters **2.4** Sine Wave Oscillators: RC phase shift oscillator, Wien bridge oscillator, Quadrature oscillator.	**10**
3	**Non-Linear Applications of Operational Amplifier**	**10**

	3.1 Comparators: Inverting comparator, non-inverting comparator, zero crossing detector, window detector and level detector. **3.2** Schmitt Triggers: Inverting Schmitt trigger, non-inverting Schmitt trigger with adjustable threshold levels. **3.3** Waveform Generators: Square wave generator and triangular wave generator with duty cycle modulation. **3.4** Precision Rectifiers: Half wave and full wave precision rectifiers and their applications. **3.5** Peak Detectors, Sample & Hold Circuits, voltage to frequency converter, frequency to voltage converter, logarithmic converters and antilog converters	
4	**Data Converters** **4.1** Analog to Digital: Performance parameters of ADC, Single Ramp ADC, ADC using DAC, Dual Slope ADC, Successive Approximation ADC, Flash ADC, Sigma Delta ADC **4.2** Digital to Analog: Performance parameters of DAC, Binary weighted register DAC, R/2R ladder DAC, Inverted R/2R ladder DAC	**07**
5	**Special Purpose Integrated Circuits – IC 555** **5.1** Functional block diagram, working, design and applications of Timer 555. **5.2** Functional block diagram, working and applications of VCO 566, PLL 565,	**07**
6	**Voltage Regulators** **6.1** Functional working three terminal fixed (78XX, 79XX series) and three terminal adjustable (LM 317, LM 337) voltage regulators, working and design of general purpose 723 voltage regulator, LDO regulators, Voltage References, Shunt Regulators (TL431)	**05**
	Total hours	**42**

List of Laboratory Experiments: (Any Six)
Suggested experiments:

1. Experiment on op amp parameters
2. Experiment on design of application using op amp (Linear)
3. Experiment on implementation of op amp application e.g. oscillator
4. Experiment on nonlinear application (e.g. comparator) of op amp
5. Experiment on nonlinear application (e.g. peak detector) of op amp
6. Experiment on ADC interfacing
7. Experiment on DAC interfacing
8. Experiment on IC 555
9. Experiment on voltage regulator (Design)
10. Experiment on implementation of instrumentation system (e.g. data acquisition).

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

Books Recommended:

Text books:

1. D. Roy Choudhury and S. B. Jain, “Linear Integrated Circuits”, New Age International Publishers, 4th Edition.
2. Ramakant A. Gayakwad, “Op-Amps and Linear Integrated Circuits”, Pearson Prentice Hall, 4th Edition.

Reference Books:

1. Sergio Franco, "Design with operational amplifiers and analog integrated circuits", Tata McGraw Hill, 3rd Edition.
2. William D. Stanley, "Operational Amplifiers with Linear Integrated Circuits", Pearson, 4th Edition
3. David A. Bell, "Operation Amplifiers and Linear Integrated Circuits", Oxford University Press, Indian Edition.
4. Ron Mancini, "Op Amps for Everyone", Newnes, 2nd Edition.

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:

Oral and practical examination of 25 marks 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 the two tests will be considered for final grading.

Term work:

Term work shall consist of minimum 6 experiments, 1 mini project and minimum 2 assignments. The topic for the mini project need to be application oriented. The mini-project is to be undertaken in a group of two to three students.

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

i.	Laboratory work (Performance of Experiments):	15 Marks
ii.	Journal Documentation (Write-up, Mini project):	10 Marks
	Total	**25 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 TY B.Tech. (Electronics Engineering) - Semester V (Autonomous)

Program: TY B.Tech. (Electronics Engineering)	Semester: V
Course: Microprocessors and Microcontrollers	Course Code: DJ19ELXC503
Course: Microprocessors and Microcontrollers Laboratory	Course Code: DJ19ELXL503

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			
3	2	--	4	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial/ Mini project/ presentation/ Journal	Total Term work	50
				--	--	25	15	10	25	

Pre-requisite courses:

- DJ19ELXC304: Digital Circuit Design

Objectives:

1. To study basic microprocessor and microcontroller architectures for system design and expose students to advanced processor architectures.

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

1. Understand and explain AVR microcontroller architecture.
2. Develop assembly language programs for AVR microcontroller.
3. Design and implement AVR microcontroller-based systems.
4. Understand and explain 16-bit and 32-bit microprocessor architecture.

Detailed Syllabus: (unit wise)

Unit	Description	Duration
1	**AVR Microcontroller Architecture:** Introduction to microcontroller, Overview of AVR family, AVR architectural features and Memory organization.	04
2	**AVR Microcontroller assembly language programming:** Addressing modes of AVR microcontroller. Instruction Set: Data transfer, Arithmetic, Logical, Branching. Assembly Language Programming.	08
3	**AVR Microcontroller Internal Hardware & Programming:** I/O port structure and programming, Interrupts and programming, Timer/ Counter and programming, Serial port and programming.	08
4	**AVR Microcontroller Interfacing & Applications:**	10

	Display interfacing: 7-segment LED display, 16x2 generic alphanumeric LCD display. Keyboard interfacing: 4x4 matrix keyboard. Analog devices interfacing: 8-bit ADC/DAC, temperature sensor (LM35). Motor interfacing: Relay, dc motor, stepper motor and servo motor.	
5	**Introduction to Intel 16-bit 8086 and 32-bit Pentium Architecture:** Features of 16-bit 8086 and 32-bit Pentium Processor, 8086 CPU and Pentium Superscalar architecture, Pipelining, 8086 Programmer's Model and Pentium Branch Prediction, Pentium: Virtual Memory (Segmented & Demand Page)	**12**
	Total hours	**42**

List of Laboratory Experiments:

Suggested experiments:

1. Study of the AVR microcontroller development board in detail.
2. a) To add two hexadecimal numbers and show the result,
   b) To multiply two hexadecimal numbers using MUL instruction,
   c) To multiply two hexadecimal numbers without using MUL instruction,
   d) To make an LED/series blink continuously.
3. To perform decade counter from 0 to 9 using one seven segment display.
4. To display the following waveforms at an output port of 8051:
   a) Square wave of frequency 3 kHz and 50% duty cycle
   b) Step wave of frequency 3 kHz (3 steps)
   c) Sawtooth wave
   d) Triangular wave
5. Generate square waves of following frequencies using Timer:
   1. 10 kHz, Timer mode 1
   2. 7 kHz, Timer mode 2
6. a) Generate square wave of 5 kHz frequency using timer interrupt,
   b) Generate square wave of 5 kHz frequency using timer interrupt and simultaneously detect input and corresponding output.
   c) Generate square waves of 5 kHz frequency using timer interrupt and simultaneously detect input and corresponding output. Also, simultaneously turn LED 'ON' using external hardware interrupt.
7. To interface an LED board with 8086.
8. To interface seven-segment display with 8086.

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

Books Recommended:

Text books:

1. The AVR Microcontroller and Embedded Systems: M. A. Mazidi, Sarmad Naimi and Sepehr Naimi. (Pearson Education)
2. 8086/8088 family - Design Programming and Interfacing: John Uffenbeck. (Pearson Education)
3. The Intel Microprocessor family: Hardware and Software principles and Applications: James L. Antonakos (Cengage Learning)

Reference Books:

1. Microprocessor and Interfacing: Douglas Hall (TMH Publication)
2. 8086 Microprocessor Programming and Interfacing the PC: Kenneth Ayala (West Publication)

3. Microcomputer Systems: 8086/8088 family Architecture, Programming and Design: Liu & Gibson (PHI Publication)

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:

Oral and practical examination of 25 marks 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 the two tests will be considered for final grading.

Laboratory: (Term work)

Term work shall consist of minimum 8 experiments 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 and Assignments):	10 Marks
	Total	**25 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 TY B.Tech. (Electronics Engineering) - Semester V (Autonomous)

Program: TY B.Tech. (Electronics Engineering)	Semester : V
Course : Advanced Control Systems	Course Code: DJ19ELEC5011
Course : Advanced Control Systems Laboratory	Course Code: DJ19ELXEL5011

<table>
<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>Total marks (A+ B)</td></tr>
<tr><td rowspan="4">Lectures</td><td rowspan="4">Practical</td><td rowspan="4">Tutorial</td><td rowspan="4">Total Credits</td><td colspan="3">Theory</td><td>Term Test 1</td><td>Term Test 2</td><td>Avg.</td><td></td></tr>
<tr><td colspan="3">75</td><td>25</td><td>25</td><td>25</td><td>100</td></tr>
<tr><td colspan="3">Laboratory Examination</td><td colspan="3">Term work</td><td rowspan="3">50</td></tr>
<tr><td>Oral</td><td>Practical</td><td>Oral & Practical</td><td>Laboratory Work</td><td>Tutorial/ Mini project/ presentation/ Journal</td><td>Total Term work</td></tr>
<tr><td>3</td><td>2</td><td>--</td><td>4</td><td>25</td><td>--</td><td>--</td><td>15</td><td>10</td><td>25</td></tr>
</table>

Pre-requisite courses:

- DJ19ELXC404: Control Systems and Instrumentation
- DJ19ELXC301: Applied Engineering Mathematics

Objective:

1. Understanding and predicting system behavior in state space and non-linear systems,
2. Design and analysis of closed loop control systems in digital methods.
3. To introduce modern state-space methods in digital systems design.

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

1. Analyze the system behavior based on the mathematical model of that system where the model may be expressed in state-space domain.
2. Justify the need for digital control systems as well as understand sampling and reconstruction of analog signals.
3. Model the digital systems using various discretization methods and understand the concept of Pulse Transfer Function.
4. Analyze the digital control systems using classical techniques.
5. Identify controllers and compensators in different controllers.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**State Space Analysis of Control Systems :** **1.1 State Variables;** State-Space Representation of Electrical Systems; State Space Representation of Nth Order Linear Differential Equation; Transformation to Phase Variable Canonical Form; **1.2** Relationship Between State Equations and Transfer Functions; Characteristic Equation; Eigen Values and Eigen Vectors; **1.3 Transformation** to Diagonal Canonical Form; Jordan Canonical Form; Decomposition	**12**

	of Transfer Function-Direct, Cascade and Parallel Decomposition; **1.4 State Diagram;** Solution of the Time-Invariant State Equation; State Transition Matrix and its Properties; Transfer Matrix; Transfer Matrix of Closed Loop Systems**.**	
2	**Controllability and Observability:** **2.1** Concept of Controllability and Observability, Kalman's Theorems on Controllability and Observability. **2.2** Relationship among Controllability, Observability and Transfer Function.	**06**
3	**Basics of discrete-time signals and discretization:** **3.1** Why digital control system? Advantages and limitations, comparison of continuous and discrete data control, block diagram of digital control system. **3.2** Impulse sampling. Nyquist-Shannon sampling theorem, reconstruction of discrete-time signals (ideal filter)	**08**
4	**Modelling of Digital Control System:** **4.1** Discretization Approaches: Impulse invariance, step invariance, bilinear transformation, finite difference approximation of derivative. **4.2** Z-transform revision and its equivalence with starred Laplace transform.	**06**
5	**Stability Analysis and Controller Design via Conventional Methods:** **5.1** Mapping between s-plane and z-plane, stability analysis of digital systems in z-plane. Effects of sampling frequency on stability. **5.2** Transient and steady-state analysis of time response, digital controller design using root-locus method.	**06**
6	**Compensators and Controllers:** **6.1 Compensators:** Types of compensation, Need of compensation, Lag compensator and Lead compensator. **6.2 Advances in Control Systems:** Introduction to Robust Control, Adaptive Control and Model Predictive control.	**04**
	Total hours	**42**

List of Laboratory Experiments:

Suggested experiments:

1. To obtain the state model from the given transfer function using state space analysis.
2. Modelling of state-space model and conversion to various canonical forms.
3. To find controllability and observability of the system described by the state equation.
4. To analyse the sampling and reconstruction of analog signal.
5. To study various discretization approaches (Impulse Invariance, Step Invariance, Bilinear Transformation)
6. Study of time domain transient and steady-state performance and performance specifications.
7. Digital controller design using Root-locus method.
8. Discrete-time system simulation in Simulink.

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

Books Recommended:

Text books:

1. Ogata Katsuhiko, "Discrete-time Control Systems", Pearson, 2nd Edition, 1995.
2. M. Gopal, "Digital Control and State Variable Methods", Tata McGraw-Hill, 3rd Edition, 2003.

Reference Books:

1. Gene Franklin, J. David Powell, Michael Workman, "Digital Control of Dynamic Systems", Addison Wesley, 3rd Edition, 1998.
2. B. C. Kuo, "Digital Control Systems", Oxford University press, 2nd edition, 2007.
3. Chi-Tsong Chen, "Linear System Theory and Design", Oxford University Press, USA, 1998.

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:

Oral examination of 25 marks 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 the two tests will be considered for final grading.

Laboratory: (Term work)

Term work shall consist of minimum 8 experiments 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 and Assignments):	10 Marks
Total:	**25 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 TY B.Tech. (Electronics Engineering) - Semester V (Autonomous)

Program: TY B.Tech. (Electronics Engineering)	Semester: V
Course: Data Structures and Algorithms	Course Code: DJ19ELEC5012
Course: Data Structures and Algorithms Laboratory	Course Code: DJ19ELXEL5012

<table>
<tr><th colspan="4" rowspan="2">Teaching Scheme
(Hours / week)</th><th colspan="7">Evaluation Scheme</th></tr>
<tr><th colspan="3">Semester End Examination Marks (A)</th><th colspan="3">Continuous Assessment Marks (B)</th><th rowspan="2">Total marks (A+ B)</th></tr>
<tr><th rowspan="3">Lectures</th><th rowspan="3">Practical</th><th rowspan="3">Tutorial</th><th rowspan="3">Total Credits</th><th colspan="3">Theory</th><th>Term Test 1</th><th>Term Test 2</th><th>Avg.</th></tr>
<tr><td colspan="3">75</td><td>25</td><td>25</td><td>25</td><td>100</td></tr>
<tr><td colspan="3">Laboratory Examination</td><td colspan="2">Term work</td><td rowspan="2">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">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 courses:

- DJ19FEC205: Computer Programming

Objectives:

1. To introduce and familiarize students with linear and non-linear data structures, their use in fundamental algorithms
2. To design and implement these data structures
3. To expose students to analyze efficiency of algorithms (using asymptotic notation).
4. To make students familiar with various sorting and searching techniques, and their performance comparison.

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

1. Define basic linear and non-linear data structures and relevant standard algorithms for them.
2. Implement operations like searching, insertion, deletion, traversal, etc. on various data structures.
3. Apply suitable (efficient) sorting algorithm and implement it.
4. Choose appropriate (efficient) searching algorithm for given problem and implement it.
5. Choose appropriate (efficient) data structure and algorithm, and apply them to solve specified problems
6. Analyze and evaluate the efficiency of algorithms and data structures based on time and space complexity.

Detailed Syllabus: (unit wise)

Unit	Description	Duration
1	**Recap of C**- Structures, Pointers, Pointers and Array, Pointers and Structures, Recursion.	02
2	**Analysis of Algorithms:** Algorithms, Characteristics of an Algorithm, Time and Space Complexities, Order of Growth functions, Preliminary Asymptotic Notations. Examples: (like Fibonacci, prefix average, Tower of Hanoi etc.)	04

	Data Structures: Introduction, need of data structures, types of data structures, Abstract Data Types (ADT)	
3	**Linear Data Structures – LIST:** List as an ADT, Array-based implementation, Linked List implementation, single linked list, double-linked list, circularly linked lists, All operations (Insertion, Deletion, Merge, Traversal, etc.) and their analysis, Applications of lists.	**05**
4	**Linear Data Structures – STACK:** Stack as an ADT, Operations, Array and Linked List representation of Stack with corresponding analysis, Applications – Reversing data, Conversion of Infix to postfix expression, Evaluating arithmetic expressions etc.	**06**
5	**Linear Data Structures – QUEUE:** Queue as an ADT, Operations, Array and Linked List representation of Queue with corresponding analysis, Linear Queue, Circular Queue, Double Ended Queue (DEQUE), and Priority Queue, Applications of Queue.	**06**
6	**Non Linear Data Structures – TREE:** Tree as an ADT, Binary Tree - Operations, Tree Traversals, Binary Search Tree (BST) – Operations and Analysis, Expression Trees, Heap-operations on heap, Applications of trees.	**05**
7	**Non Linear Data Structures – GRAPH:** Representation of Graph (Array and Linked List), Types of Graph, Breadth-First Search (BFS), Depth–First Search (DFS), Minimum Spanning Tree, Prim and Kruskal Algorithm, Applications of graphs.	**06**
8	**Searching, Sorting Techniques:** Searching - Linear Search, Binary Search. Sorting – Bubble Sort, Selection Sort, Heap Sort, Insertion Sort, Merge Sort, Quick Sort, Radix Sort. Analysis and comparison of Searching and Sorting Techniques.	**08**
	Total hours	**42**

List of Laboratory Experiments:

Suggested experiments: (Any 08)

1. Implementations of stack menu driven program
2. Implementation of multi-stack in one array.
3. Implementations of Infix to Postfix. Transformation and its evaluation program.
4. Implementations of circular queue menu driven program.
5. Implementations of double ended queue menu driven program.
6. Implementations of queue menu driven program.
7. Implementation of Priority queue program using array.
8. Implementations of Linked Lists menu driven program. (Single and Double)
9. Implementation of different operations on linked list –copy, concatenate, split, reverse, count no. of nodes etc.
10. Implementations of Linked Lists menu driven program (stack and queue).
11. Implementations of Binary Tree menu driven program.
12. Implementation of Binary Tree Traversal program.
13. Implementation of construction of expression tree using postfix expression.
14. Implementations of BST program.
15. Implementation of various operations on tree like – copying tree, mirroring a tree, counting the number of nodes in the tree, counting only leaf nodes in the tree.
16. Implementations of Graph menu driven program (DFS & BFS).
17. Implementations of Radix sort and Insertion sort menu driven program.
18. Implementations of Heap Sort.
19. Implementations of Advanced Bubble Sort, Insertion Sort and Selection Sort menu driven Program.
20. Implementations of searching methods (Linear Search, Binary Search) menu driven program.
21. Implementation of hashing functions with different collision resolution techniques

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

Books Recommended:

Text books:

1. R. F. Gilberg and B. A. Forouzan, Data Structures – A Pseudocode Approach with C, 2nd Edition, Cengage Learning, 2005.
2. Ellis Horowitz, Satraj Sahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, W. H. Freeman and Company.

Reference Books:

1. Mark A. Weiss, Data Structures and Algorithm Analysis in C, 4th Edition, Pearson, 2014.
2. M. T. Goodritch, R. Tamassia, D. Mount, Data Structures and Algorithms in C++, Wiley, 2004.
3. Kruse, Leung, Tondo, Data Structures and Program Design in C, 2nd Edition, Pearson Education, 2013.
4. Tenenbaum, Langsam, Augenstein, Data Structures using C, Pearson, 2004.
5. J. P. Tremblay and P. G. Sorenson, Introduction to Data Structures and its Applications, 2nd Edition, McGraw-Hill, 1984.
6. Aho, Hopcroft, Ullman, Data Structures and Algorithms, Addison-Wesley, 2010.
7. Reema Thareja, Data Structures using C, Oxford, 2017.

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:

Oral examination of 25 marks 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 the two tests will be considered for final grading.

Laboratory: (Term work)

Term work shall consist of minimum 8 experiments 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 and Assignments):	10 Marks
	Total:	**25 Marks**

Syllabus for TY B.Tech. (Electronics Engineering) - Semester V (Autonomous)

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 TY B.Tech. (Electronics Engineering) - Semester V (Autonomous)

Program: TY B.Tech. (Electronics Engineering)	Semester: V
Course : Antennas and Wave Propagation	Course Code: DJ19ELEC5013
Course : Antennas and Wave Propagation Laboratory	Course Code: DJ19ELXEL5013

<table>
<tr><th colspan="4" rowspan="2">Teaching Scheme
(Hours / week)</th><th colspan="7">Evaluation Scheme</th></tr>
<tr><th colspan="3">Semester End Examination Marks (A)</th><th colspan="3">Continuous Assessment Marks (B)</th><th rowspan="2">Total marks (A+ B)</th></tr>
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<tr><td>25</td><td>--</td><td>--</td><td>--</td><td>25</td><td>25</td></tr>
</table>

(- 2 HOURS TUTORIALS PER BATCH)*

Pre-requisite courses:

- DJ19FEC102 & 202: Engineering Physics – I & II
- DJ19ELXC301: Applied Engineering Mathematics

Objectives:

1. To calculate energy transported by means of electromagnetic waves from one point to another and to study polarization of waves.
2. To solve electromagnetic problems using different numerical methods.
3. To extend the students' understanding about the propagation of the waves of different types.
4. To understand the radiation concepts.
5. To solve transmission line problems graphically using smith chart.

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

1. Analyze the behavior of electromagnetic waves in different media.
2. Evaluate various parameters of transmission lines and radiating systems.
3. Apply computational techniques (FEM, FDM, MOM) to analyze electromagnetic field distribution.
4. Understand different antenna parameters.
5. Understand different types of linear wire antenna and antenna arrays

Syllabus for TY B.Tech. (Electronics Engineering) - Semester V (Autonomous)

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Wave propagation and polarization** **1.1** Maxwell's equation for time varying and harmonically varying fields in various medium. **1.2** Wave Equation and its solution in partially conducting media (lossy dielectric), perfect dielectrics, free space and good conductors, Skin Effect and concept of Skin depth. **1.3** Electromagnetic Power: Poynting Vector and Power Flow in free space, dielectric and conducting media **1.4** Propagation in different media: Behavior of waves for normal and oblique incidence in dielectrics and conducting media. **1.5** Polarization of wave: Linear, Circular and Elliptical.	**10**
2	**Computational Electromagnetics** **2.1** Finite Difference Method (FDM): Neumann type and mixed boundary conditions, Iterative solution of finite difference equations, solutions using band matrix method **2.2** Finite Element Method (FEM): triangular mesh configuration, finite element discretization, 2.3 Method of Moment (MOM): Field calculations of conducting wire 4.0 Fundamentals of Radiating Systems	**08**
3	**Transmission Lines and Smith Chart** **3.1** Transmission Line parameters and equivalent circuit. Transmission line equation and solution. **3.2** Secondary Parameters: Propagation constant, characteristic impedance, reflection and transmission coefficient, Input Impedance, SWR. **3.3** introduction to Smith chart and its application.	**08**
4	**Antenna Fundamentals and Wire Antenna** **4.1** Concept of retarded potentials, Lorentz Condition for radiating system. **4.2** Antenna Parameters: Radiation Patterns, beam-width, Radiation intensity, directivity, power gain, band-width, radiation resistance. radiation efficiency, effective length, effective area. reciprocity theorem of antenna coupling, antenna temperature, Friss transmission equation. **4.3** Infinitesimal dipole, small dipole, and finite length half wave dipole and monopole antenna.	**08**
5	**Antenna Arrays.** **5.1** Two element array, Pattern multiplication N element linear array. **5.2** Uniform amplitude and spacing Broad side and End fire array. **5.3** Binominal arrays and Dolph – Chebyshev arrays.	**08**
	Total hour	**42**

List of Tutorials: (Any eight)

1. Maxwell's equations.
2. Wave equation and parameters.
3. Wave polarization.
4. Poynting's power and skin depth.
5. Finite element method. (FEM)...
6. Finite Difference method. (FDM).
7. Transmission line equation and parameters

8. Graphical analysis of TL using Smith chart.
9. Antenna parameters.
10. Wire antennas.
11. Antenna Arrays.

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

Books Recommended:

Text books:

1. Matthew N.D. Sadiku, "Principles of Electromagnetics", Oxford International Student 4th Edition, 2007
2. R.K. Shevgaonkar, "Electromagnetic Waves", TATA McGraw Hill Companies, 3rd Edition, 2009.
3. C. A. Balanis, "Antenna Theory" Wiley India Pvt. ltd, 2nd Edition, 2007.

Reference Books:

1. J.D. Kraus, R.J. Marhefka, and A.S. Khan, "Antennas & Wave Propagation", McGraw Hill Publications, 4th Edition, 2011
2. Edward C. Jordan and Keth G. Balmin, "Electromagnetic Waves and Radiating Systems", Pearson Publications, 2nd Edition, 2006

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:

Oral examination of 25 marks 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 the two tests will be considered for final grading.

Tutorial: (Term work)

Term work shall consist of minimum 08 tutorials based on problem solving of each module.

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

i. Problem solving and its presentation in tutorials**. (25 Marks)**

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

Prepared by Checked by Head of the Department Principal

Syllabus for TY B.Tech. (Electronics Engineering) - Semester V (Autonomous)

<table>
<tr><td colspan="5">Program: TY B.Tech. (Electronics Engineering)</td><td colspan="5">Semester : V</td></tr>
<tr><td colspan="5">Course : Skill based Course – I Laboratory</td><td colspan="5">Course Code: DJ19ELXSBL1</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme (Hours / week)</td><td colspan="10">Evaluation Scheme</td></tr>
<tr><td colspan="5">Semester End Examination Marks (A)</td><td colspan="4">Continuous Assessment Marks (B)</td><td>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><td rowspan="2"></td></tr>
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<tr><td colspan="5">Laboratory Examination</td><td colspan="3">Term work</td><td rowspan="2">Total Term work</td><td rowspan="3">75</td></tr>
<tr><td rowspan="2">-</td><td rowspan="2">4</td><td rowspan="2">--</td><td rowspan="2">2</td><td>Oral</td><td>Practical</td><td colspan="2">Oral & Practical</td><td>Laboratory Work</td><td colspan="2">Tutorial/ Mini project/ presentation/ Journal</td></tr>
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</table>

Pre-requisite courses:

- DJ19FEW: Workshop
- DJ19ELXC503: Microprocessors and Microcontrollers.

Objectives:

1. To understand PCB design layout and fabrication techniques.
2. To understand architecture and working of IoT ready DIY boards – Arduino, ESP8266 and Raspberry Pi.

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

1. Demonstrate use of open source PCB design tool – Kicad, for designing single and double sided PCBs
2. Fabricate and test at-least two circuits.
3. Demonstrate working of IoT ready DIY board for providing task-based solutions.

The main intention of Skill Based Laboratory is to motivate and enable students to apply knowledge and skills acquired out of courses studied to solve and implement solutions to practical problems. Under the program structure students do undergo various theory, laboratory and tutorial courses in which they do experimentation based on the curriculum requirements. Skill based laboratory is expected to go beyond the scope of curriculum of courses. Activities of practical societal problem solutions, by involving in group activities, are expected to enrich student-skills in the areas of modern tool usage, team building & team work-ethics, along-with effective skills of communication.

Content/Coverage expected:

- Use of Open source tool Kicad for design and layout of single and double sided PCBs
- Fabrication of single sided PCB along-with component mounting and testing for given circuit.
- Architecture, specifications and features of modules: Arduino, ESP8266 and SBC – Raspberry-pi.
  Activities involving:

- Interfacing LED, switches, buzzers etc. as elementary introductory activities.
- Interfacing using sensors like: temperature, pressure, humidity, distance, gas, light, sound, touch etc.

Recommended tasks/projects:

PCB Design:
Astable Multivibrator: Schematic Creation, Mapping Components with Footprints, Setting Parameters for PCB designing, Laying Tracks on PCB and PCB Layout, PCB fabrication using manual photo-paper transfer technique, drilling, component mounting and testing.

DIY Boards: (Arduino, ESP8266/ESP32, Raspberry – Pi)
Display counter (SSDs or LCD), Light intensity controller (Pulse Width Modulation), Analog to digital Conversion, Wireless Connectivity to Arduino, Introduction to Thingspeak platform, Sending data to cloud (MQTT Protocol), Evaluation of other similar IoT data transfer protocols.

Recommended Resources:
Books:
1. Arduino Cookbook: Michael Margolis. (O'REILLY Publication)
2. Raspberry Pi User Guide, 4th Edition: Eben Upton, Gareth Halfacree. (Wiley)

Web Resources:
1. eSIM Tutorial: Spoken Tutorial Project, IIT Bombay. [online] Available at: <https://spoken-tutorial.org/tutorial-search/?search_foss=eSim&search_language=English> [Accessed 25 March 2021].
2. Arduino Tutorial: Spoken Tutorial Project, IIT Bombay. [online] Available at: https://spoken-tutorial.org/tutorial-search/?search_foss=Arduino&search_language=English [Accessed 26 March 2021].

Evaluation Scheme:

Group comprising of not more than maximum **three** (03) students is recommended for this course. Each group shall keep proper assessment record of progress of the project and at the end of the semester it should be assessed for awarding TW marks. The final examination will be based on demonstration in front of internal and external examiner. In the examination each individual student shall be assessed for her/his contribution, understanding and knowledge gained about the task completed.

Prepared by Checked by Head of the Department Principal

Syllabus for TY B.Tech. (Electronics Engineering) - Semester V (Autonomous)

<table>
<tr><td colspan="9">Program: Third Year B.Tech. in Electronics Engineering</td><td colspan="3">Semester: V</td></tr>
<tr><td colspan="9">Course: Professional and Business Communication Laboratory</td><td colspan="3">Course Code: DJ19IHL2</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme
(Hours / week)</td><td colspan="8">Evaluation Scheme</td></tr>
<tr><td colspan="4">Semester End Examination Marks (A)</td><td colspan="3">Continuous Assessment Marks (B)</td><td>Total marks (A+ B)</td></tr>
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<tr><td colspan="4">--</td><td>--</td><td>--</td><td>--</td><td>--</td></tr>
<tr><td colspan="4">Laboratory Examination</td><td colspan="2">Term work</td><td rowspan="2">Total Term work Oral & Practical</td><td rowspan="3">50</td></tr>
<tr><td rowspan="2">--</td><td rowspan="2">4*</td><td rowspan="2">--</td><td rowspan="2">2</td><td>Oral</td><td>Practical</td><td>Oral & Practical</td><td>Oral</td><td>Practical</td></tr>
<tr><td>--</td><td>--</td><td>--</td><td>--</td><td>---</td><td>50</td></tr>
</table>

*2 hrs. of theory (class wise) and 2 hrs. of activity based laboratory (batch wise)

Pre-requisite courses:

- DJ19FEC206: Effective Communication Skills

Objectives:

1. To inculcate professional and ethical attitude at the workplace.
2. To enhance communication and interpersonal skills.
3. To develop effective presentation skills.
4. To hone written skills for technical documentation

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

1. Plan, organize and write technical documents like reports, proposals and research papers in the prescribed format using appropriate language and style with an understanding of ethics in written communication.
2. Apply techniques of writing resume, participating in a group discussion and facing interviews.
3. Develop interpersonal skills in professional and personal situations.
4. Understand the documentation process of meetings and conduct meetings in a professional manner.
5. Understand communication across cultures and work ethics.
6. Design and deliver effective presentations using Power Point

Syllabus for TY B.Tech. (Electronics Engineering) - Semester V (Autonomous)

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Technical Writing** **Report Writing:** Types of report, parts of formal report, collection of data and survey analysis, pre-writing of report, language and style in reports, formatting of reports, referencing in report **Proposal Writing:** Types of technical proposals, format of proposal, language and style, presentation of proposal **Technical Paper Writing**: Parts of a technical paper, language and formatting, referencing in IEEE format Plagiarism: Types of plagiarism, consequences of plagiarism	**08**
2	**Employment Skills** **Group Discussion:** Purpose of a GD, types of GD, criteria for evaluating a GD, Dos and Don'ts of a GD, Tips to be successful in GD Cover Letter & Resume Writing: Format and content of cover letter, types of resume, structure, content and formatting of resume **Interview Skills:** Types and modes of interview, Preparation for interview, Dos and Don'ts of interview, frequently asked questions during interview	**06**
3	**Introduction to Interpersonal Skills** **Emotional Intelligence:** Definition, difference between IQ and EQ, how to develop EQ **Leadership:** Types of leadership, leadership styles, case studies Team Building: Difference between group and team, importance of team work, strategies to be a good team player **Time Management:** Importance of time management, cultural views of time, 80/20 rule, time wasters, setting priorities and goals, **Conflict Management:** Types of conflicts, strategies to manage conflict, case studies	**05**
4	**Meetings and Documentation** Planning and preparation for meetings, strategies for conducting effective meetings, notice, agenda and minutes of a meeting, business meeting etiquettes.	**03**
5	**Cross-cultural communication and Ethics** Communication across cultures, professional and work ethics, responsible use of social media, introduction to Intellectual Property Rights	**03**
6	**Presentation Skills** Presentation strategies, overcoming stage fear, techniques to prepare effective PowerPoint presentation	**03**
	Total hour	**28**

List of Assignments:

1. Business Proposal (PowerPoint presentation)
2. Resume writing
3. Interpersonal Skills (documentation of activity)
4. Meetings and Documentation (Notice, Agenda, Minutes of Mock Meetings)
5. Business ethics
6. Presentation Skills

Books Recommended:

Reference Books

1. Fred Luthans, *"Organizational Behavior",* McGraw Hill, edition
2. Lesiker and Petit, *"Report Writing for Business",* McGraw Hill, edition
3. Huckin and Olsen, *"Technical Writing and Professional Communication",* McGraw Hill
4. Wallace and Masters, *"Personal Development for Life and Work",* Thomson Learning, 12th edition
5. Heta Murphy, *"Effective Business Communication",* Mc Graw Hill, edition
6. Sharma R.C. and Krishna Mohan, *"Business Correspondence and Report Writing",* Tata McGraw Hill Education
7. Ghosh, B. N., *"Managing Soft Skills for Personality Development",* Tata McGraw Hill. Lehman,
8. Bell, Smith, "Management Communication" Wiley India Edition, 3rd edition.
9. Dr. Alex, K.," Soft Skills", S Chand and Company
10. Subramaniam, R., "Professional Ethics" Oxford University Press.

Evaluation Scheme:

Laboratory: (Term work)

Term work shall consist of 6 assignments, Group Discussion and Power Point Presentation based on the written report

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

i.	Assignments	(25) Marks
ii.	Project Report and Presentation	(15) Marks
iii.	Group Discussion	(10) Marks
	TOTAL:	**(50) 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 TY B.Tech. (Electronics Engineering) - Semester V (Autonomous)

<table>
<tr><td colspan="5">Program: TY B.Tech. (Electronics Engineering)</td><td colspan="5">Semester : V</td></tr>
<tr><td colspan="5">Course : Innovative Product Development - III</td><td colspan="5">Course Code: DJ19ILL1</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme
(Hours / week)</td><td colspan="9">Evaluation Scheme</td></tr>
<tr><td colspan="4">Semester End Examination Marks (A)</td><td colspan="4">Continuous Assessment Marks (B)</td><td>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><td></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="2">Total Term work</td><td rowspan="2">50</td></tr>
<tr><td>-</td><td>2</td><td>--</td><td>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 colspan="4"></td><td>--</td><td>--</td><td>25</td><td>25</td><td>--</td><td>25</td><td></td></tr>
</table>

Objectives:

1. To acquaint the students with the process of identifying the need (considering a societal requirement) and ensuring that a solution is found out to address the same by designing and developing an innovative product.
2. To familiarize the students with the process of designing and developing a product, while they work as part of a team.
3. To acquaint the students with the process of applying basic engineering fundamentals, so as to attempt at the design and development of a successful value-added product.
4. To inculcate the basic concepts of entrepreneurship and the process of self-learning and research required to conceptualize and create a successful product.

Outcome:

Learner will be able to:

1. Identify the requirement for a product based on societal/research needs.
2. Apply knowledge and skills required to solve a societal need by conceptualizing a product, especially while working in a team.
3. Use standard norms of engineering concepts/practices in the design and development of an innovative product.
4. Draw proper inferences through theoretical/ experimental/simulations and analyze the impact of the proposed method of design and development of the product.
5. Develop interpersonal skills, while working as a member of the team or as the leader.
6. Demonstrate capabilities of self-learning as part of the team, leading to life-long learning, which could eventually prepare themselves to be successful entrepreneurs.
7. Demonstrate product/project management principles during the design and development work and also excel in written (Technical paper preparation) as well as oral communication.

Guidelines for the proposed product design and development:

1. Students shall form a team of 3 to 4 students (max allowed: 5-6 in extraordinary cases, subject to the approval of the department review committee and the Head of the department).
2. Students should carry out a survey and identify the need, which shall be converted into conceptualization of a product, in consultation with the faculty supervisor/head of department/internal committee of faculty members.
3. Students in the team shall understand the effective need for product development and accordingly select the best possible design in consultation with the faculty supervisor.
4. Students shall convert the best design solution into a working model, using various components drawn from their domain as well as related interdisciplinary areas.
5. Faculty supervisor may provide inputs to students during the entire span of the activity, spread over 2 semesters, wherein the main focus shall be on self-learning.
6. A record in the form of an activity log-book is to be prepared by each team, wherein the team can record weekly progress of work. The guide/supervisor should verify the recorded notes/comments and approve the same on a weekly basis.
7. The design solution is to be validated with proper justification and the report is to be compiled in a standard format and submitted to the department. Efforts are to be made by the students to try and publish a technical paper, either in the institute journal, "Techno Focus: Journal for Budding Engineers" or at a suitable publication, approved by the department research committee/ Head of the department.
8. The focus should be on self-learning, capability to design and innovate new products as well as on developing the ability to address societal problems. Advancement of entrepreneurial capabilities and quality development of the students through the year long course should ensure that the design and development of a product of appropriate level and quality is carried out, spread over 4semesters, i.e. during the semesters III to VI.

Guidelines for Assessment of the work:

1. The review/ progress monitoring committee shall be constituted by the Head of the Department. The progress of design and development of the product is to be evaluated on a continuous basis, holding a minimum of two reviews in each semester.
2. In the continuous assessment, focus shall also be on each individual student's contribution to the team activity, their understanding and involvement as well as responses to the questions being raised at all points in time.
3. Distribution of marks individually for the both reviews as well as for the first review during the subsequent semester shall be as given below:
    A. Marks awarded by the supervisor based on log-book : 20
    B. Marks awarded by review committee : 20
    C. Quality of the write-up : 10

Review/progress monitoring committee may consider the following points during the assessment.

In the semester V, the entire design proposal shall be ready, including components/system selection as well as the cost analysis. Two reviews will be conducted based on the presentation given by the student's team.

- First shall be for finalization of the product selected.
- Second shall be on finalization of the proposed design of the product.

The overall work done by the team shall be assessed based on the following criteria;

1. Quality of survey/ need identification of the product.
2. Clarity of Problem definition (design and development) based on need.
3. Innovativeness in the proposed design.
4. Feasibility of the proposed design and selection of the best solution.
5. Cost effectiveness of the product.
6. Societal impact of the product.
7. Functioning of the working model as per stated requirements.
8. Effective use of standard engineering norms.
9. Contribution of each individual as a member or the team leader.
10. Clarity on the write-up and the technical paper prepared.

The semester V reviews may be based on relevant points listed above, as applicable.

Guidelines for Assessment of Semester Reviews:

- The write-up should be prepared as per the guidelines given by the department.
- The design and the development of the product shall be assessed through a presentation and demonstration of the working model by the student team to a panel of Internal and External Examiners, preferably from industry or any research organizations having an experience of more than five years, approved by the Head of the Institution. The presence of the external examiner is desirable only for the 2nd presentation in semester VI. Students are compulsorily required to present the outline of the technical paper prepared by them during the final review in semester VI.

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

Syllabus for TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

<table>
<tr><td colspan="8">Program: TY B.Tech. (Electronics Engineering)</td><td colspan="4">Semester : VI</td></tr>
<tr><td colspan="8">Course: Embedded Systems & RTOS</td><td colspan="4">Course Code: DJ19ELXC601</td></tr>
<tr><td colspan="8">Course: Embedded Systems & RTOS Laboratory</td><td colspan="4">Course Code: DJ19ELXL601</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme (Hours / week)</td><td colspan="8">Evaluation Scheme</td></tr>
<tr><td colspan="4">Semester End Examination Marks (A)</td><td colspan="3">Continuous Assessment Marks (B)</td><td>Total marks (A+ B)</td></tr>
<tr><td rowspan="3">Lectures</td><td rowspan="3">Practical</td><td rowspan="3">Tut.</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><td></td></tr>
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<tr><td colspan="4">Laboratory Examination</td><td colspan="3">Term work</td><td rowspan="3">Total Term work</td><td>50</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">2</td><td rowspan="2">--</td><td rowspan="2">4</td><td>Oral</td><td>Practical</td><td>Oral & Practical</td><td>Laboratory Work</td><td colspan="2">Tutorial/ Mini project/ presentation/ Journal</td><td rowspan="2"></td></tr>
<tr><td>--</td><td>--</td><td>25</td><td>15</td><td colspan="2">10</td><td>25</td></tr>
</table>

Pre-requisite courses:

- DJ19ELXC503: Microprocessors and Microcontrollers

Objectives:

1. To study concepts involved in embedded hardware and software for system realization.

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

1. Identify and describe various characteristic features and applications of embedded systems.
2. Analyze and identify hardware for embedded system implementations.
3. Analyze and identify various software issues involved in embedded systems for real time requirements.
4. Analyze and explain the design life-cycle for embedded system implementation.

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Introduction to embedded systems** **1.1** Characteristics and Design metrics of Embedded system. **1.2** Real time systems: Need for Real-time systems, Hard-Soft Real-time systems. **1.3** Challenges in Embedded system Design: Power, Speed and Code density. **1.4** Power supply considerations in Embedded systems: Low power features-Idle & Power	**05**

	down mode, Sleep mode, and Brown-out detection	
2	**Embedded Hardware** **2.1** Introduction to Embedded Architecture: Embedded cores, Types of memories, Sensor Interface **2.2** Communication Interfaces: Comparative study of serial communication interfaces (RS-232, RS-485), SPI, I2C, CAN, USB, Wired LAN (Ethernet) (IEEE 802.3), Wireless LANs & Long Distance Comm. Wireless Fidelity – LoRA Mesh. Selection criteria of above interfaces **2.3** ARM Architecture: Comparative study of A, R & M series of processors with introduction to different families and their capabilities- use cases. Understanding the Cortex M0/0+, M3, M4, M33, M55 and M7 in terms of scalability from low performance applications to base server applications and moving towards 64-bit architecture. Introducing Pipelining Concepts & basic instruction features such as ARM Mode, Thumb and Thumb 2 mode, Instruction and Data Caches (Cortex-M7 and Cortex-A); FPU & MPU Coprocessors. **2.4** Introducing the STM 32 F446 RE Nucleo Board and its capabilities with sensor interfacing	**16**
3	**Introduction to RTOS** **3.1 Real-time Operating system:** Need of RTOS in Embedded system software and comparison with GPOS, Foreground/Background processes, Interrupt latency, Task, Task-states, Multi-tasking, Context switching, Task scheduling, Scheduling algorithms - Rate Monotonic Scheduling, Earliest Deadline First, Inter-process communication, Semaphore, Mailbox, Message queues, Event timers, Task synchronization- Shared data, Priority inversion, Deadlock. Memory Management, Shared Devices and Mutex (Priority Inversion within it) Critical Code Sections (Disable Scheduler temporarily). **3.4 Introduction to FreeRTOS:** Testing above concepts of RTOS on STM 32 F446 Nucleo Board such as task scheduling, context switching, semaphore creations and memory management	**16**
4	**System Integration, Testing and Debugging Methodology** **4.1** Embedded Product Design Life-Cycle (EDLC) **4.2** Hardware-Software Co-design **4.3 Testing & Debugging:** Boundary-scan/JTAG interface concepts, Black-Box testing, White-Box testing, hardware emulation, logic analyzer.	**05**
	Total hours	**42**

List of Laboratory Experiments:

Suggested experiments: (Any Six)

1. Introduction to STM 32 446 Nucleo Board & Getting started with Mbed
2. Introduction to the FRDM 64F Platform & Getting Started with Mbed
3. Porting, Compiling, Downloading & Running your first program – Blinky LED
4. Interfacing LCD, Speaker, Temperature Sensor & Accelerometer with Nucleo Board
5. Introduction to FreeRTOS and FreeRTOS Task Creation – Understanding the System Core Clock
6. FreeRTOS Hello World App, Semi hosting & UART Setup
7. FreeRTOS App Debugging using Segger System View Tools
8. FreeRTOS Scheduler, Kernel Interrupts, RTOS Tick and SysTick Timer
9. FreeRTOS Context Switching & Task Notification and Task Deletions

10. FreeRTOS Queue Management, Semaphore for Synchronizations, Mutual Exclusion and Memory Management

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

Books Recommended:

Text books:

1. Dr. K. V. K. K. Prasad, "Embedded Real Time System: Concepts, Design and Programming", Dreamtech, New Delhi, 2014.
2. Designing Embedded Systems & Internet of Things with ARM Mbed by Perry Xiao
3. Sriram Iyer, Pankaj Gupta, "Embedded Real Time Systems Programming", Tata McGraw Hill Publishing Company ltd.,2003.

Reference Books:

1. David Simon, "An Embedded Software Primer", Pearson, 2009.
2. Jonathan W. Valvano, "Embedded Microcomputer Systems–Real Time Interfacing", Publisher-Cengage Learning, 3rd Edition, 2012.
3. Andrew Sloss, Domnic Symes, Chris Wright, "ARM System Developers Guide Designing and Optimising System Software", Elsevier, 2004
4. Frank Vahid, Tony Givargis, "Embedded System Design–A Unified Hardware/Software Introduction", John Wiley & Sons Inc., 2002.
5. Shibu K. V., "Introduction to Embedded Systems", Tata McGraw Hill Education Private Limited, New Delhi, 2009.

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:

Oral and practical examination of 25 marks will be based on the entire syllabus including the practicals performed during laboratory sessions.

Continuous Assessment (B):

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.

Term work:

Term work shall consist of minimum 6 experiments, 1 Mini-project and minimum 2 assignments.

Syllabus for TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

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

i.	Laboratory work (Performance of Experiments):	15 Marks
ii.	Journal Documentation (Mini project and Assignments):	10 Marks
	Total:	**25 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 TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

<table>
<tr><td colspan="8">Program: TY B.Tech. (Electronics Engineering)</td><td colspan="3">Semester: VI</td></tr>
<tr><td colspan="8">Course: Digital Signal Processing</td><td colspan="3">Course Code: DJ19ELXC602</td></tr>
<tr><td colspan="8">Course: Digital Signal Processing Laboratory</td><td colspan="3">Course Code: DJ19ELXL602</td></tr>
<tr><td colspan="4" rowspan="3">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>Oral</td><td>Practical</td><td>Oral & Practical</td><td>Laboratory Work</td><td colspan="2">Tutorial/ Mini project/ presentation /Journal</td></tr>
<tr><td>--</td><td>--</td><td>25</td><td>15</td><td colspan="2">10</td></tr>
</table>

Pre-requisite Courses:

- EJ19ELXC301, 401: Applied Engineering Mathematics – I & II

Objectives:

1. To understand the discrete time signals and system.
2. To introduce the students to discrete transforms and signal processing techniques.
3. To teach the design techniques and performance analysis techniques of digital filter.

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

1 Understand the discrete time signals and system behavior of LSI/LTI system in time domain
2 Understand the concept of digital frequency, effect of aliasing due to improper sampling.
3 Understand linear and circular convolution analytical and graphical methods
4 Demonstrate knowledge of various frequency spectrum using DTFS, DTFT DFT/FFT.
5 Design IIR (Infinite impulse response) filter using Z – Transform and its realization using canonic structure, cascade and parallel form.
6 Design FIR (Finite impulse response) filter using windowing and frequency sampling method.

Syllabus for TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

Detailed Syllabus: (unit wise)		
Unit	**Topics**	**Duration**
1	**Fundamentals of Discrete Time Signal and System** **1.1** Sampling of analog signal and its reconstruction of signal using Nyquist sampling and aliasing effect, Asynchronous Sampling & Spectral Leakage. **1.2** Mathematical representation of elementary DT signals. Operation on DT signals. Classification of DT signals **1.3** Mathematical representation of DT system and Classification of DT system. **1.4** System analysis in time domain using linear convolution and circular convolution. Interconnected series and parallel DT system Auto correlation and cross correlation.	**10**
2	**Frequency Domain Analysis of Discrete Time System** **2.1** Concept of complex discrete frequency, definition, properties of unilateral and bilateral Z Transform, ROC. **2.2** Inverse Z transform, Analysis and characterization of LTI system using Z transform: impulse and step response, causality, and stability. **2.3** System realization - Direct form I, Direct Canonic form II, Cascade and Parallel forms.	**08**
3	**Frequency Domain Analysis of Discrete Time Signal** **3.1** Definition DTFS, DTFT, DFT, IDFT, Properties of DFT, linear and circular convolution of sequences using DFT and IDFT, Filtering of long data sequences: Overlap Save and Overlap Add method. **3.2** Computation of Fast Fourier transform (FFT), Radix-2 decimation in time and decimation in frequency FFT algorithms, inverse FFT (IFFT), Goertzel Algorithm (Feedback and Feedforward).	**08**
4	**Infinite Impulse Response (IIR) Digital Filter Design** **4.1** Mapping of S-plane to Z-plane, impulse invariance method, bilinear transformation method, Design of IIR digital filters from analog filters approximations: Butterworth, Chebyshev type I and II. **4.2** Analog and digital frequency transformation.	**08**
5	**Finite Impulse Response (FIR) Digital Filter Design** **5.1** Characteristics of FIR digital filters, Minimum Phase, Maximum Phase, Mixed Phase and Linear Phase Filters Frequency response, location of the zeros of linear phase FIR filters. **5.2** Design of FIR filter using window techniques (Rectangular, Hamming, Hanning, Blackmann, and Bartlett) Design of FIR filter using Frequency Sampling technique. Comparison of IIR and FIR filters, Multi-Rate systems, Over & Under Sampling.	**08**
	Total hours	**42**

List of Laboratory Experiments:

Suggested experiments: (Any Eight)

Simulation tools like Matlab / Scilab can be used.

1. Generation of Basic Discrete time Signals.
2. Study of linear Convolution summation in time domain.
3. Computation of frequency Spectrum of Periodic discrete signal using DTFS.

4. Computation of frequency Spectrum of Aperiodic discrete signal using DTFT.
5. Computation of N – point DFT and inverse DFT.
6. Computation of Circular Convolution using FFT/IFFT.
7. IIR Butterworth filter design using IIM technique.
8. IIR Chebyshev filter design using BLT technique.
9. Design of FIR Low Pass filter using Hamming window.
10. Design of FIR Band Pass filter using Blackmann window.

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

Books Recommended:

Text books:

1. Emmanuel C. Ifeachor, Barrie W. Jervis, "Digital Signal Processing", A Practical Approach by, Pearson Education
2. Tarun Kumar Rawat, "Digital Signal Processing", Oxford University Press, 2015 Processing.

Reference Books:

1. ProakisJ., Manolakis D., "Digital Signal Processing", 4th Edition, Pearson Education
2. Sanjit K. Mitra, Digital Signal Processing – A Computer Based Approach – edition 4e 3. McGraw Hill Education (India) Private Limited.
3. Oppenheim A., Schafer R., BuckJ.,"DiscreteTimeSignalProcessing",2ndEdition, Pearson Education.

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:

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 the two tests will be considered for final grading.

Laboratory: (Term work)

Term work shall consist of minimum 8 experiments, 2 assignments.

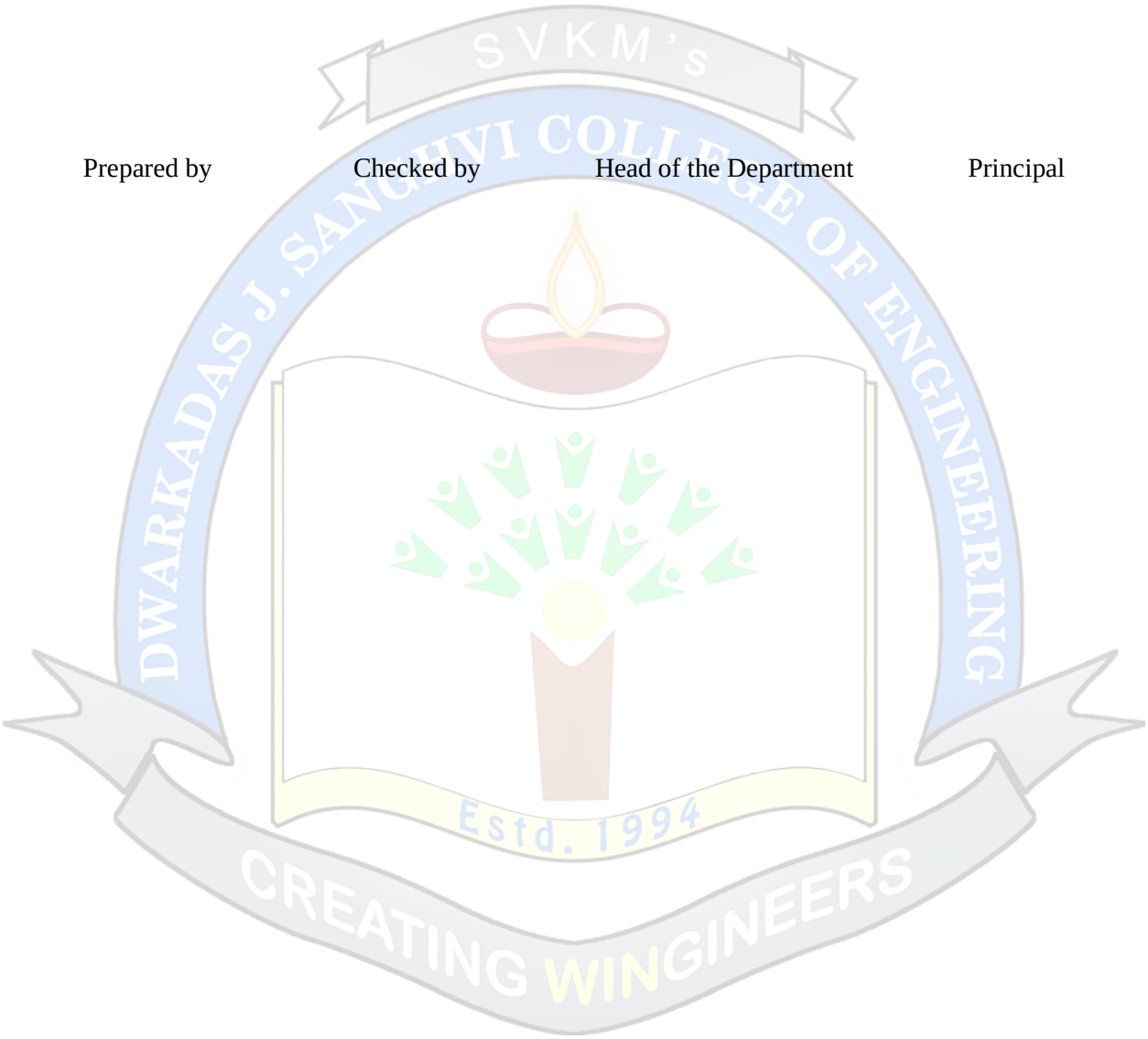
Syllabus for TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

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

i. Laboratory work (Performance of Experiments):	15 Marks
ii. Journal Documentation (Write-up, Tutorial):	10 Marks
Total:	**25 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 TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

Program: TY B.Tech. (Electronics Engineering)	Semester: VI
Course: VLSI Design	Course Code: DJ19ELXC603
Course: VLSI Design Laboratory	Course Code: DJ19ELXL603

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 courses:

- DJ19ELXC302: Electronics Devices and Circuits- I
- DJ19ELXC304: Digital Circuit Design
- DJ19ELXC502: Design with Linear Integrated Circuits

Objectives:

1. To study MOS based circuit realization using different design styles
2. To highlight the fundamental issues in data path and system level design

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

1. Demonstrate a clear understanding of choice of technology, scaling and system level design issues.
2. Analyze MOS based inverters.
3. Design MOS based circuits with different design styles.
4. Design semiconductor memories, adders and multipliers.

Syllabus for TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Technology Trend:** **1.1 Technology Comparison:** Comparison of BJT and MOS technology **1.2 MOSFET Scaling:** Types of scaling, MOSFET capacitances	**04**
2	**MOSFET Inverters:** **2.1 Types of MOS inverters:** Active and passive load inverters and their comparison. **2.2 Circuit Analysis of CMOS Inverters:** Static Analysis of CMOS inverter, Calculation of all critical voltages and noise margins. **2.3 CMOS Layout**: Design rules, layout of inverter, NOR and NAND gates.	**10**
3	**MOS Circuit Design Styles:** **3.1 Design Styles:** Static CMOS, Pseudo NMOS, C^2MOS, Dynamic, Domino, MODL, NORA, pass transistor logic and transmission gate. **3.2 Circuit Realization:** SR FF and JK FF realization using Static CMOS design style. Basic gates, functions, MUX and 1-Bit Shift Register realization using pass transistor logic and transmission gates.	**08**
4	**Semiconductor Memories:** **4.1 SRAM:** 6T SRAM cell operation, design strategy, read/write circuits, sense amplifier. **4.2 DRAM**: 1T_DRAM cell operation, refresh operation and physical design. **4.3 ROM Array**: NAND and NOR based PROM, Nonvolatile read/write memories classification, FG-MOS structures, operation and programming techniques.	**08**
5	**Data Path Design:** **5.1 Adder:** CLA adder, implementation using different design styles, Manchester carry chain and high speed adders like carry skip, carry select and carry save. **5.2 Multipliers and shifter:** Array multiplier and 4X4 barrel shifter.	**05**
6	**VLSI Clocking and System Design:** **6.1 Clocking:** CMOS clocking styles, Clock generation, stabilization and distribution networks. **6.2 Low Power CMOS Circuits:** Various components of power dissipation in CMOS, Limits on low power design, low power design through voltage scaling. **6.3 I/O pads and Power Distribution:** ESD protection, input circuits, output circuits, power distribution scheme. **6.4 Interconnect:** Interconnect scaling and crosstalk.	**07**
	Total hours	**42**

List of Laboratory Experiments:

Suggested experiments: (Any Eight)

1. Performance analysis of CMOS inverter with different KR
2. Generate layout for the CMOS inverter, NAND & NOR gates
3. Generate layout for the given expression
4. Estimation of noise margins for resistive load inverter & CMOS inverter
5. Implementation of Switching networks using Pass transistors & Transmission gates
6. Implementation of NAND and NOR based ROM arrays

7 Analysis and simulation of Differential sense amplifier
8 Implementation of adder, multiplier, and barrel shifter circuits
9 Analysis of Power dissipation in CMOS circuits
10 Delay estimations in CMOS circuits

Books Recommended:

Text books:

1. Sung-Mo Kang and Yusuf Leblebici, "*CMOS Digital Integrated Circuits Analysis and Design*", Tata McGraw Hill, 3rd Edition.
2. John P. Uyemura, "Introduction to VLSI CIRCUITS AND SYSTEMS", Wiley India Pvt. Ltd.

Reference Books:

1. Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, "*Digital Integrated Circuits: A Design Perspective*", Pearson Education, 2nd Edition.
2. Neil H. E. Weste, David Harris and Ayan Banerjee, "*CMOS VLSI Design: A Circuits and Systems Perspective*", Pearson Education, 3rd Edition.
3. Kaushik Roy and Sharat C. Prasad, "*Low-Power CMOS VLSI Circuit Design*", Wiley, Student Edition.

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:

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 the two tests will be considered for final grading.

Laboratory: (Term work)

Term work shall consist of minimum 8 experiments 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 and Assignments):	10 Marks
	Total:	**25 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 TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

Program: TY B.Tech. (Electronics Engineering)	Semester: VI
Course: Advanced Power Electronics	Course Code: DJ19ELEC6021
Course: Advanced Power Electronics Laboratory	Course Code: DJ19ELEL6021

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 courses:

- DJ19ELXC501: Power Electronics
- DJ19ELXC404: Control Systems and Instrumentation
- DJ19FEC105: Basic Electrical & Electronics Engineering

Objectives:

1. Enhance & implement methods in design of power electronics systems.
2. Extend the importance of 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 and implement modern methods of analysis and control of power electronic systems.
2. Carry out the theoretical analysis of the power electronic systems from the 'Systems Theory' point of view.
3. Appreciate the ubiquity of power electronic systems in engineering fields.
4. Simulate and analyse power electronic systems.

Detailed Syllabus: (unit wise)

Unit	Description	Duration
1	**Three-phase Rectifiers** **1.1** 3-phase half-wave and full-wave controlled rectifiers with R and RL load, Effect of source inductance & calculation of performance parameters	08
2	**Three-phase inverters and control**	10

	2.1 Introduction to McMurray & Bedford Inverters- Half Bridge & Full Bridge Configuration **2.1** Three phase bridge inverters ($120^0$and 180^0 conduction mode) with R and RL load **2.2** PWM for 3-phase voltage source inverters, Space Vector Modulation (SVM) technique for 3-phase voltage source inverters	
3	**DC-DC Converters** **3.1** Buck –Boost Converters, Switching Mode Regulators, Cuk Regulators, Multi-Phase Choppers **3.2** SMPS – Flyback Converter, Push-Pull Converter, Half & Full Bridge Configuration	**10**
4	**Power Electronic Applications in DC Drives** **4.1** Introduction to DC motors, speed control of DC motor, drives with semi converters, full converters and dual converters. **4.2** Chopper-based drive & Electric braking of DC motors	**07**
5	**Power Electronic Applications in AC Drives** Introduction to three-phase induction motor, speed control methods for three-phase induction motor: 1. V/F Control 2. Slip Power Recovery Schemes	**07**
	Total hours	**42**

List of Laboratory Experiments:

Laboratory Experiments: Lab session includes seven experiments plus one presentation on case study. The Term work assessment can be carried out based on the different tools and the rubrics decided by the concerned faculty members and need to be conveyed to the students well in advanced.

Suggested Experiments:

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

Suggested topics for Case Study: Faculty members can suggest topics pertaining to above syllabus and ask students to submit complete report covering design issues, hardware and software details and applications.

Books Recommended:

Text books:

1. M. Rashid, Power Electronics: Circuits, Devices, and Applications, PHI, 3rd Edition.
2. P. S. Bimbhra, Power Electronics, Khanna Publishers, 2012.

Reference Books:

1. R. W. Erickson, D. Maksimovic, Fundamentals of Power Electronics, Springer, 2nd Edition.

2. Mohan, Undeland and Robbins, Power Electronics: Converters, Applications and Design, Wiley (Student Edition), 2nd Edition.
3. M. D. Singh, K. B. Khanchandani, Power Electronics, Tata McGraw Hill, 2nd Edition.
4. J. P. Agrawal, Power Electronics Systems: Theory and Design, Pearson Education, 2002

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:

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 the two tests will be considered for final grading.

Laboratory: (Term work)

Term work shall consist of minimum 8 experiments 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:	10 Marks
	Total:	**25 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 TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

<table>
<tr><td colspan="5">Program: TY B.Tech. (Electronics Engineering)</td><td colspan="5">Semester: VI</td></tr>
<tr><td colspan="5">Course: Operating Systems</td><td colspan="5">Course Code: DJ19ELEC6022</td></tr>
<tr><td colspan="5">Course: Operating Systems Laboratory</td><td colspan="5">Course Code: DJ19ELEL6022</td></tr>
<tr><td colspan="4" rowspan="2">Teaching Scheme (Hours / week)</td><td colspan="9">Evaluation Scheme</td></tr>
<tr><td colspan="4">Semester End Examination Marks (A)</td><td colspan="4">Continuous Assessment Marks (B)</td><td>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><td></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="2">Total Term work</td><td rowspan="2">50</td></tr>
<tr><td>3</td><td>2</td><td>--</td><td>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 colspan="4"></td><td>25</td><td>--</td><td>--</td><td>15</td><td>10</td><td>25</td></tr>
</table>

Pre-requisite courses:

- DJ19FEC205: Computer Programming

Objectives: The objective of this course is to

1. Familiarize students with the functionality of an Operating System, its basic components and interaction among them.
2. Expose students to analyze and evaluate different policies for scheduling, deadlocks, memory management, synchronization, system calls, file systems and I/O
3. Implement these policies using a suitable programming language.

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

1. Analyze and evaluate the performance of different process and disk scheduling algorithms.
2. Demonstrate inter-process communication and process synchronization.
3. Analyze and evaluate various deadlock detection, avoidance and removal techniques.
4. Analyze and evaluate memory management policies in different scenarios.
5. Evaluate different file organization and access techniques.

Syllabus for TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Overview of Operating System** **1.1 Introduction:** Operating System operations, Process management, Memory management, storage management, Protection and security, Distributed and special purpose Systems. **1.2 System Structure:** Operating system services and interface, System calls and its types, System programs, Operating System Design and implementation, OS structure, Virtual machines, OS debugging and generation, System boot.	**06**
2	**Overview of Operating System** **2.1 Introduction:** Operating System operations, Process management, Memory management, storage management, Protection and security, Distributed and special purpose Systems. **2.2 System Structure:** Operating system services and interface, System calls and its types, System programs, Operating System Design and implementation, OS structure, Virtual machines, OS debugging and generation, System boot.	**06**
3	**Process Management** **3.1 Process concept:** Process Scheduling, Operation on process and Inter process communication. **3.2 Multithreaded Programming:** Multithreading models and thread libraries, threading issues. **3.3 Process Scheduling:** Basic concepts, Scheduling algorithms and Criteria, thread scheduling	**08**
4	**Process coordination** **4.1 Synchronization:** The critical Section Problem, Peterson's Solution, synchronization, Hardware and semaphores, Classic problems of synchronization, monitors. **4.2 Deadlocks:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock	**08**
5	**Memory Management** **5.1 Memory Management strategies:** Swapping, Contiguous Memory Allocation, Paging, Segmentation. **5.2 Virtual Memory Management:** Demand Paging, Page Replacement, Allocation of Frames, Thrashing.	**06**
6	**Storage Management** **6.1 File System:** File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection. **6.2 Implementing file System:** File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free- Space Management **6.3 Secondary Storage Structure:** Overview of Mass-Storage Structure, Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management; RAID	**06**

	Structure.	
7	**I/O Systems** **7.1** Overview I/0 Hardware, Application I/0 Interface, overview of system protection	**02**
	Total hours	**42**

List of Laboratory Experiments:

Suggested experiments: (Any Eight)

1. Installation of Linux
2. Study of Linux general purpose commands
3. Basic System administrative task: Process management, Memory management, File system management, User management
4. Implementation of Scheduling algorithms (FIFO, SJF, Priority, Round Robin)
5. Implementation of classic Synchronization problems using semaphores (producer-consumer, reader-writer, dining philosophers)
6. Implementation of Bankers Problem (Deadlock avoidance)
7. Implementation of Memory management/ allocation policies (1st fit, best fit, worst fit)
8. Implementation of Page replacement algorithms (FIFO, LRU, OPTIMAL)
9. Implementation of Disk scheduling algorithms (FCFS, SSTF, SCAN, CSCAN, LOOK)
10. Implementation of file allocation strategies (Sequential, Indexed, Linked)
11. Implementation of the following file organization techniques (Single level directory, Two level directory, Hierarchical)
12. Case study on comparison of various Operating Systems based on parameters such as process management, memory management, I/O management, etc.

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

Books Recommended:

Text books:

1. Abraham Silberschatz, Greg Gagne, Peter Baer Galvin, “Operating System Concepts”, 8th Edition, Wiley, January 2018.
2. Tanenbaum, “Modern Operating System”, 4th Edition, Pearson Education, 2014.
3. William Stallings, “Operating Systems: Internal and Design Principles”, 8th Edition, Pearson, 2014.
4. Randal. K. Michael, “Mastering Shell Scripting”, 2nd Edition, Wiley Publication, 2008.

Reference Books:

1. A Tanenbaum, “Operating System Design and Implementation”, 3rd Edition, Pearson, January 2015.
2. Phillip A. Laplante, Seppo J. Ovaska, “Real Time Systems Design and Analysis”, 4th Edition, Wiley-IEEE Press, Dec 2011.
3. Naresh Chauhan, “Principles of Operating Systems”, Oxford University Press; 1st Edition, 2014.

Syllabus for TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

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:

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 the two tests will be considered for final grading.

Laboratory: (Term work)

Term work shall consist of minimum 8 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
	Total:	**25 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 TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

<table>
<tr><td colspan="8">Program: TY B.Tech. (Electronics Engineering)</td><td colspan="4">Semester: VI</td></tr>
<tr><td colspan="8">Course: Mobile Communication</td><td colspan="4">Course Code: DJ19ELEC6023</td></tr>
<tr><td colspan="8">Course: Mobile Communication Laboratory</td><td colspan="4">Course Code: DJ19ELEL6023</td></tr>
<tr><td colspan="4" rowspan="3">Teaching Scheme (Hours / week)</td><td colspan="8">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="2">Lectures</td><td rowspan="2">Practical</td><td rowspan="2">Tutorial</td><td rowspan="2">Total Credits</td><td colspan="4">Theory</td><td>Term Test 1</td><td>Term Test 2</td><td>Avg.</td></tr>
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<tr><td>Oral</td><td>Practical</td><td>Oral & Practical</td><td>Laboratory Work</td><td colspan="2">Tutorial/ Mini project/ presentation/Journal</td></tr>
<tr><td>25</td><td>--</td><td>--</td><td>15</td><td colspan="2">10</td><td>25</td></tr>
</table>

Pre-requisite: Knowledge of

1. DJ19ELXC403: Analog and Digital Communication.
2. DJ19ELEC5013: Antenna and Wave Propagation.

Objectives:

1. To study different multiple access and spread spectrum techniques.
2. To study the concept of Mobile radio propagation, cellular system design.
3. To understand mobile technologies like GSM and CDMA.
4. To know the mobile communication evolution of 2G, 3G, 3 GPP,4G and 5G.

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

1. Analyse the concepts of basic cellular system, frequency reuse, channel assignment.
2. Analyse the fundamentals of radio propagation, Path loss and comprehend the effect of Fading.
3. Compare the different multiple access technologies and different spread spectrum techniques.
4. Acquire the knowledge about overall GSM cellular concept and analyze its services and features.
5. Comprehend the features of CDMA technology.
6. Analyse the evolution of cellular technology from 2G to 4G cellular systems.

Syllabus for TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

Detailed Syllabus: (unit wise)		
Unit	**Description**	**Duration**
1	**Concept of Cellular Communication** **1.1** Introduction to cellular communications, Frequency reuse, Channel assignment strategies **1.2 Cellular Processes:** Call setup, Handoff strategies, interference and system capacity, Co-channel Interference reduction with the use of Directional Antenna **1.3 Traffic Theory:** Trunking and Grade of service, Improving Coverage and capacity in Cellular systems: Cell splitting, Sectoring, Micro-cell Zone concept	**08**
2	**Mobile Radio Propagation** **2.1** Introduction to Radio wave propagation, Free space propagation model, the three basic Propagation mechanisms, The Ground Reflection (two-ray) model, Practical Link budget design using Path-Loss models: Log-distance Path –loss model. **2.2 Small scale Multipath Propagation:** Factors influencing small scale fading, Doppler shift, Parameters of mobile multipath channels **2.3** Types of small scale fading, fading effects due to Doppler spread, fading effects due to Multipath Time delay spread, Raleigh and Rician distributions interfaces.	**08**
3	**Multiple access techniques & Spread spectrum Modulation** **3.1 Multiplexing and Multiple Access:** Time Division Multiple Access, Frequency Division Multiple Access, Spread-spectrum multiple-access: Code Division Multiple Access **3.2 Spread spectrum Modulation:** Need for and concept of spread spectrum modulation, PN- sequence generation, properties of PN-sequence, Gold sequence generation, Direct-sequence SS, Frequency-hopping	**08**
4	**GSM:** GSM network architecture, Signaling protocol architecture, Identifiers, Physical and Logical Channels, Frame structure, Speech coding, Authentication and security, Call procedure, Hand-off procedure, Services and features	**08**
5	**IS-95:** Frequency and channel specifications of IS-95, Forward and Reverse CDMA channel, Packet and Frame formats, Mobility and Resource management	**06**
6	**Evolution from 2G to 4G:** GPRS, EDGE technologies, 2.5G CDMA-One cellular network, W-CDMA (UMTS), CDMA2000, LTE, Introduction to 5G Networks	**04**
	Total Hours	**42**

List of Laboratory Experiments:

Suggested experiments: (Any Eight)

1. Clustering and system capacity
2. Locating a co-channel
3. Study of sectoring
4. Free Space Propagation Model

5. PN sequence generator
6. Walsh code generator
7. Half rate convolutional encoder
8. Study of Hand-off

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

Books Recommended:

Text books:

1. Theodore Rappaport, "Wireless Communications: Principles and Practice, Pearson Publication, 2nd Edition.
2. ITI Saha Misra, "Wireless Communication and Networks: 3G and Beyond"
3. Vijay Garg, "IS-95CDMAandcdma2000: Cellular/PCS System Implementation", Pearson Publication.

Reference Books:

1. T.L Singal, "Wireless Communication", Tata McGraw Hill, 2010
2. Upena Dalal, "Wireless Communication", Oxford University Press, 2009
3. Andreas F Molisch, "Wireless Communication", John Wiley, India, 2006.
4. Vijay Garg, "Wireless communication and Networking", Pearson Publication

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:

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 the two tests will be considered for final grading.

Laboratory: (Term work)

Term work shall consist of minimum 8 experiments and 2 assignments (One assignment from syllabus module & 1 assignment as case study or IEEE paper review on any topic related to syllabus.

Syllabus for TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

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/Report /Assignments: 10 Marks
Total: **25 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 TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

<table>
<tr><td colspan="8">Program: TY B.Tech. (Electronics Engineering)</td><td colspan="3">Semester: VI</td></tr>
<tr><td colspan="8">Course: Skill Based Course – II Laboratory</td><td colspan="3">Course Code:
DJ19ELXSBL2</td></tr>
<tr><td colspan="4" rowspan="3">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>
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<tr><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>25</td><td>25</td><td>25</td><td>25</td></tr>
</table>

Pre-requisites:

1. DJ19ELXL406: Computer Programming, Java Programming.
2. DJ19ELXC503: Microprocessors and Microcontrollers.

Objectives:

1. To learn web development.
2. To learn application development for Android platforms.

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

1. Design and deploy web pages/sites for a predefined functional definition.
2. Design and deploy applications in Android platform for a specified application.

The main intention of Skill Based Laboratory is to motivate and enable students to apply knowledge and skills acquired out of courses studied to solve and implement solutions to practical problems. Under the program structure students do undergo various theory, laboratory and tutorial courses in which they do experimentation based on the curriculum requirements. Skill based laboratory is expected to go beyond the scope of curriculum of courses. Activities of practical societal problem solutions by involving in group activities are expected to enrich student-skills in the areas of modern tool usage, team building and team work, ethics along-with effective skill of communication.

Group comprising of not more than maximum **three** (03) students is recommended for this course. Each group shall keep proper assessment record of progress of the project and at the end of the semester it should be assessed for awarding TW marks. The final examination will be based on demonstration in front of internal and external examiner. In the examination each individual student shall be assessed for her/his contribution, understanding and knowledge gained about the task completed.

Recommended Tasks:

Web development activities:

1. Create website using HTML and CSS
2. Login authentication
3. Product landing page
4. Java script quiz game
5. To-do list
6. Google homepage lookalike
7. Word counter
8. Countdown timer
9. Customize website using HTML and CSS

Application Development: (Kotlin & Android Studio for Android)

1. Calculator app.
2. Music player app.
3. To do app.
4. Alarm app.

Prepared by	Checked by	Head of the Department	Principal

Syllabus for TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

<table>
<tr><td colspan="8">Program: TY B.Tech. (Electronics Engineering)</td><td colspan="3">Semester: VI</td></tr>
<tr><td colspan="8">Course: Innovative Product Development – IV</td><td colspan="3">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="4">Semester End Examination Marks (A)</td><td colspan="3">Continuous Assessment Marks (B)</td><td>Total marks (A+ B)</td></tr>
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<tr><td colspan="4"></td><td>--</td><td>--</td><td>25</td><td>25</td><td>--</td><td>25</td><td></td></tr>
</table>

Objectives:

1. To acquaint the students with the process of identifying the need (considering a societal requirement) and ensuring that a solution is found out to address the same by designing and developing an innovative product.
2. To familiarize the students with the process of designing and developing a product, while they work as part of a team.
3. To acquaint the students with the process of applying basic engineering fundamentals, so as to attempt at the design and development of a successful value-added product.
4. To inculcate the basic concepts of entrepreneurship and the process of self-learning and research required to conceptualize and create a successful product.

Outcome:

Learner will be able to:

1. Identify the requirement for a product based on societal/research needs.
2. Apply knowledge and skills required to solve a societal need by conceptualizing a product, especially while working in a team.
3. Use standard norms of engineering concepts/practices in the design and development of an innovative product.
4. Draw proper inferences through theoretical/ experimental/simulations and analyze the impact of the proposed method of design and development of the product.
5. Develop interpersonal skills, while working as a member of the team or as the leader.
6. Demonstrate capabilities of self-learning as part of the team, leading to life-long learning, which could eventually prepare them to be successful entrepreneurs.

7. Demonstrate product/project management principles during the design and development work and also excel in written (Technical paper preparation) as well as oral communication.

Guidelines for the proposed product design and development:

1. Students shall form a team of 3 to 4 students (max allowed: 5-6 in extraordinary cases, subject to the approval of the department review committee and the Head of the department).
2. Students should carry out a survey and identify the need, which shall be converted into conceptualization of a product, in consultation with the faculty supervisor/head of department/internal committee of faculty members.
3. Students in the team shall understand the effective need for product development and accordingly select the best possible design in consultation with the faculty supervisor.
4. Students shall convert the best design solution into a working model, using various components drawn from their domain as well as related interdisciplinary areas.
5. Faculty supervisor may provide inputs to students during the entire span of the activity, spread over 2 semesters, wherein the main focus shall be on self-learning.
6. A record in the form of an activity log-book is to be prepared by each team, wherein the team can record weekly progress of work. The guide/supervisor should verify the recorded notes/comments and approve the same on a weekly basis.
7. The design solution is to be validated with proper justification and the report is to be compiled in a standard format and submitted to the department. Efforts are to be made by the students to try and publish a technical paper, either in the institute journal, "Techno Focus: Journal for Budding Engineers" or at a suitable publication, approved by the department research committee/ Head of the department.
8. The focus should be on self-learning, capability to design and innovate new products as well as on developing the ability to address societal problems. Advancement of entrepreneurial capabilities and quality development of the students through the year long course should ensure that the design and development of a product of appropriate level and quality is carried out, spread over 4 semesters, i.e. during the semesters III to VI.

Guidelines for Assessment of the work:

1. The review/ progress monitoring committee shall be constituted by the Head of the Department. The progress of design and development of the product is to be evaluated on a continuous basis, holding a minimum of two reviews in each semester.
2. In the continuous assessment, focus shall also be on each individual student's contribution to the team activity, their understanding and involvement as well as responses to the questions being raised at all points in time.
3. Distribution of marks individually for both reviews as well as for the first review during the subsequent semester shall be as given below:
    A. Marks awarded by the supervisor based on log-book : 20
    B. Marks awarded by review committee : 20
    C. Quality of the write-up : 10

Review/progress monitoring committee may consider the following points during the assessment.

In the semester V, the entire design proposal shall be ready, including components/system selection as well as the cost analysis. Two reviews will be conducted based on the presentation given by the student's team.

- First shall be for finalization of the product selected.
- Second shall be on finalization of the proposed design of the product.

The overall work done by the team shall be assessed based on the following criteria;

1. Quality of survey/ need identification of the product.
2. Clarity of Problem definition (design and development) based on need.
3. Innovativeness in the proposed design.
4. Feasibility of the proposed design and selection of the best solution.
5. Cost effectiveness of the product.
6. Societal impact of the product.
7. Functioning of the working model as per stated requirements.
8. Effective use of standard engineering norms.
9. Contribution of each individual as a member or the team leader.
10. Clarity on the write-up and the technical paper prepared.

The semester VI reviews may be based on relevant points listed above, as applicable.

Guidelines for Assessment of Semester Reviews:

- The write-up should be prepared as per the guidelines given by the department.
- The design and the development of the product shall be assessed through a presentation and demonstration of the working model by the student team to a panel of Internal and External Examiners, preferably from industry or any research organizations having an experience of more than five years, approved by the Head of the Institution. The presence of the external examiner is desirable only for the 2nd presentation in semester VI. Students are compulsorily required to present the outline of the technical paper prepared by them during the final review in semester VI.

Prepared by Checked by Head of the Department Principal

Syllabus for TY B.Tech. (Electronics Engineering) - Semester VI (Autonomous)

Program: TY B.Tech. (Electronics Engineering)	Semester: VI
Course: Environmental Studies	Course Code: DJ19A3

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			
1	--	--	--	Oral	Practical	Oral & Practical	Laboratory Work	Tutorial/ Mini project/ presentation/ Journal	Total Term work	--
				--	--	--	--	--	--	

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.	4
2	**Technological growth for Sustainable Development:** Social, Economical 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	4
3	**Environmental impact due to technology:**	5

	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	
	Total hours	**13**

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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