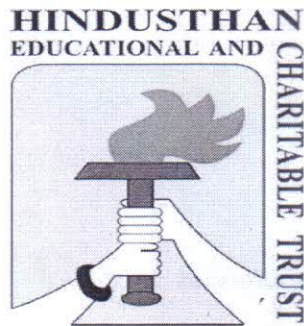


**LEARNING OUTCOMES–BASED CURRICULUM
FRAMEWORK (LOCF)**

in the

**POST GRADUATE PROGRAMME
M.Sc., ELECTRONICS AND COMMUNICATION SYSTEMS**

**FOR THE STUDENTS ADMITTED FROM THE
ACADEMIC YEAR 2020 - 2021 AND ONWARDS**



HICAS

HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)

(Affiliated to Bharathiar University and Accredited by NAAC)

COIMBATORE-641028

TAMILNADU, INDIA.

Phone: 0422-4440555

Website: www.hindusthan.net/hicas/

TABLE OF CONTENTS

- **Preamble**
- **Vision and Mission**
- **Program Educational Objectives (PEO)**
- **Program Outcome (PO)**
- **Program Specific Outcome (PSO)**
- **Scheme of Examinations**
- **Scheme of Evaluations**
- **Syllabus for courses**
- **Abstract of Scheme of Examinations**
- **Assessment methods**

INTRODUCTION

The students pursuing Electronics and Communication Systems course would develop in-depth understanding of various aspects of the subject. The working principles, design guidelines and experimental skills associated with different design methodologies for digital and embedded systems, communication electronics and control systems and various applications of electronic devices, circuits and systems are among such important aspects.

PREAMBLE

Learning Outcome Based Curriculum Framework for Master of Science (M.Sc.) in Electronics and Communication Systems is a post graduation course. The credit system implemented through this curriculum, would allow students to develop a strong footing in the fundamentals and specialize in the disciplines of his/her liking and abilities.

VISION

To provide world class education to the students to face global challenges and to inculcate the latest trends in technological advancement. To cater the needs of the environmental and ethical values in the mind of students to become good citizens and entrepreneurs.

MISSION

The Mission of the college is to pursue a philosophy of perpetual acquisition of knowledge. The important policy is to provide value-based education and to bring out the hidden potentials in students that equip them to approach life with optimism.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Post Graduates of Electronics and Communication Systems program will

PEO1: Have a successful career in electronics academia / industries / entrepreneurs.

PEO2: Critically analyze existing literature in an area of specialization and ethically develop innovative and research-oriented methodologies to solve the problems identified.

PROGRAM OUTCOME (PO)

PO1: Utilize the basic knowledge in mathematics, science and engineering in Electronics and Communication field.

PO2: Identify, formulate and solve complex problems to achieve demonstrated conclusions using mathematical principles and sciences.

PO3: Design system components that meet the requirement of public safety and offer solutions to the societal and environmental concerns.

PO4: Apply research-based knowledge to design and conduct experiments, analyze, synthesize and interpret the data pertaining to Electronics and Communication problems and arrive at valid conclusions.

PROGRAM SPECIFIC OUTCOME (PSO)

PSO1: Apply the fundamental concepts of electronics and communication engineering to design a variety of components and systems for applications including signal processing, image processing, communication, networking, embedded systems, VLSI and control system.

PSO2: Select and apply cutting-edge engineering hardware and software tools to solve complex Electronics and Communication Engineering problems.

PSO3: Adapt the emerging Information and Communication Technologies (ICT) to innovate ideas and solutions to existing/novel problems.

HINDUSTHAN COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)COIMBATORE-641028
SCHEME OF EXAMINATIONS - CBCS & LOCF PATTERN

(For the students admitted from the Academic year 2020-2021 and onwards)

PG PROGRAMME

Programme: M.Sc., Electronics and Communication Systems

CourseCode	CourseType	Course Title	Lecture Hours/Week	Exam Duration (Hours)	I.E	E.E	Total	Credit Points
Semester – I								
20ELP01	DSC	Digital and Network Communication	5	3	30	70	100	5
20ELP02	DSC	Microwave and RADAR Navigation System	5	3	30	70	100	4
20ELP03	DSC	8051 Microcontroller with C Programming	5	3	30	70	100	4
20ELP04	DSC	Power Electronics	5	3	30	70	100	4
20ELP05	DSC	Practical I: Digital Communication Systems	5	5	40	60	100	3
20ELP06	DSC	Practical II: 8051 Microcontroller and its Applications	5	5	40	60	100	3
20ELPV01	ACC	VAC-I	2	1	50	-	50	1
20ELPJ01	AEE	Aptitude / Placement Training	2	1	50	-	50	Grade*
20ELPJ02	AEE	Online Classes	2	1	-	-	-	C/NC**
Semester – II								
20ELP07	DSC	Optical Fiber Communication	5	3	30	70	100	5
20ELP08	DSC	MEMS and Control Systems	5	3	30	70	100	4
20ELP09	DSC	Embedded Systems and RTOS	5	3	30	70	100	4
20ELP10	DSC	Digital System Design using VHDL	5	3	30	70	100	4
20ELP11	DSC	Practical III: Optical and Microwave Communication	5	5	40	60	100	3
20ELP12	DSC	Practical IV: Embedded System and RTOS	5	5	40	60	100	3
20GSP01	AECC	Skill Based Subject: Cyber Security	2	2	100	--	100	2
20ELPV02	ACC	VAC-II	2	1	50	-	50	1
20ELPJ03	AEE	Aptitude / Placement Training	2	1	50	-	50	Grade*
20ELPJ04	AEE	Online Classes	2	1	-	-	-	C/NC**
Semester – III								
20ELP13	DSC	Mobile Communication	5	3	30	70	100	5
20ELP14	DSC	Digital Signal Processing	5	3	30	70	100	4
20ELP15	DSC	Modern VLSI Design	5	3	30	70	100	4

20ELP16	DSC	Practical V: Digital Signal Processing	5	5	40	60	100	3
20ELP17	DSC	Practical VI: VLSI Design	5	5	40	60	100	3
20ELP18A	DSE	Wireless Sensor Networks	5	3	30	70	100	4
20ELP18B		ARM Core Processor						
20ELPV03	ACC	VAC-III	2	1	50	-	50	1
20ELPJ05	AEE	Aptitude / Placement Training	2	1	50	-	50	Grade*
20ELPJ06	AEE	Online Classes	2	1	-	-	-	C/NC**
Semester – IV								
20ELP19	DSC	Nanoelectronics and Nanosystems	6	3	30	70	100	6
20ELP20A	DSE	Real Time System Design	6	3	30	70	100	5
20ELP20B		Virtual Instrumentation						
20ELP21A	DSE	Elective Practical: Internet of Things	6	5	40	60	100	3
20ELP21B		Elective Practical: Virtual Instrumentation						
20ELP22	SEC	Project Work	10	-	50	150	200	5
20ELPV04	ACC	VAC-IV	2	1	50	-	50	1
20ELPJ07	AEE	Aptitude / Placement Training	2	1	50	-	50	Grade*
20ELPJ08	AEE	Online Classes	2	1	-	-	-	C/NC**
TOTAL CREDITS								94

- VAC-Value Added Course (Extra Credit Courses)
 - JOC- Job Oriented course
 - C/NC** -Completed/ Not Completed
 - I.E-Internal Exam
 - E.E-External Exam
- * Grades depends on the marks obtained

Range of marks	Equivalent remarks
80 and above	Exemplary
70 – 79	Very good
60 – 69	Good
50 – 59	Fair
Below 50	Not Satisfactory = Not completed

PASSING MINIMUM

- Passing Minimum for UG 40% and for PG 50 %
- For UG: 35 % (25 marks) in EE and 40 % in Total Marks
- For PG 50 % (35 marks) in EE and 50 in Total Marks

List of Open Elective Papers	
Open Electives	Courses offered by the Departments (Additional credit Course)
	(a) Electronic Test Instruments
	(b) Verilog HDL
	(c) Bioelectronics
	(d) Material Characterization
	(e) IoT and its Applications
	(f) Electric Vehicle Design
	(g) Ocean Electronics
	(h) Artificial Intelligence using Raspberry Pi

List of Elective Papers/ DSE		
(Can choose any one of the paper as electives)		
Electives/	Course Code	Title
DSE-I	20ELP18A	Wireless Sensor Networks
	20ELP18B	ARM Core Processor
Electives/	20ELP20A	Real Time System Design
	20ELP20B	Virtual Instrumentation
Electives/	20ELP21A	Elective Practical: Internet of Things
	20ELP21B	Elective Practical: Virtual Instrumentation
DSE-III		

ABSTRACT FOR SCHEME OF EXAMINATIONS

(For the Candidates admitted during the academic year 2020 - 2021 and onwards)

S.No.	Course (AEE/DSC/DSE/GE/ACC/SEC)	Papers	Credit	Total Credits	Marks	Total Marks
1	DSC	18	3/ 4 / 5 /6	71	100	1800
2	ACC	4	1	4	50	200
3	AECC	1	2	2	100	100
4	DSE	3	3 /4 / 5	12	100	300
5	SEC	1	5	5	200	200
6	AEE	8	G	G	50	200
Total		35	-	94	-	2800

PG Courses- Scheme of Evaluation (Internal & External Components)

(For the students admitted during the academic year 2020-2021 and onwards)

1. Internal Marks for all PG

Components	Marks
Test	5
Model Exam	10
Assignment	5
Attendance*	5
Seminar	5#
TOTAL	30

*Split-up of Attendance Marks for UG

- ♣ 75-79 - 1 marks
- ♣ 80-84 - 2 marks
- ♣ 85-89 - 3 marks
- ♣ 90-94 - 4 marks
- ♣ 95-100 - 5 marks

(# (3+2)-3 for External & 2 for (Internal paper presentation or poster design)

2. a) Components for Practical I.E.

Components	Marks
Test-I	20
Test - II	20
Total	40

b) Components for Practical E.E.

Components	Marks
Experiments	50
Record	5
Viva	5
Total	60

3. Institutional/ Industrial Training, Mini Project and Major Project Work

Institutional /Industrial Training (I.E)		Mini Project (I.E)	Major Project Work		
Component	Marks	Marks	Component	Marks	Total Marks
Work diary	25	-	I.E a)Attendance	20	50
Report	50	50	b)Review	30	
Viva-voce	25	50			
Total	100	100	E.E* a) Final report	120	150
			b)Viva-voce	30	
Total					200

*Evaluation of report and conduct of viva voce will be done jointly by Internal and External Examiners

4. Components for Cyber Security Paper

Components	Marks
Two Tests (each 2 hours) of 40marks each [4 out of 7 descriptive type questions 4 x 10 = 40 Marks]	80
Two assignments (2 x 10)	20

5. Value Added Courses and Aptitude/Placement courses:

Components	Marks
Two Test (each 1 hour) of 25 marks each QP is objective pattern (25x1=25)	50
Total	50

Guidelines:

1. The passing minimum for these items should be 50%
2. If the candidate fails to secure 50% passing minimum, he / she may have to reappear for the same in the subsequent semesters
3. Item No's:4,5, are to be treated as 100% Internal papers.
4. For item No.5, Tests conducted through online modules (Google Form/any other)

PG PATTERN
QUESTION PAPER PATTERN FOR CIA EXAM

Reg.No:-----

Q.P.CODE:

HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)
----- DEGREE CIA EXAMINATIONS -----20-----

(-----Semester)

BRANCH: -----

Subject Name: -----

Time: Two Hours

Maximum: 50 Marks

Section-A (3 x 6=18 Marks)

Answer ALL Questions

ALL questions carry EQUAL Marks

(Q.No: 1 to 3 Either Or type)

Section-B (4 x 8=32 Marks)

Answer ALL Questions

ALL questions carry EQUAL Marks

(Q.No: 4 to 7 Either Or type)

QUESTION PAPER PATTERN FOR MODEL/ END SEMESTER EXAM

Reg.No:-----

Q.P.CODE:

HINDUSTHAN COLLEGE OF ARTS AND SCIENCE (AUTONOMOUS)
----- DEGREE MODEL EXAMINATIONS -----20-----

(-----Semester)

BRANCH: -----

Subject Name: -----

Time: Three Hours

Maximum: 70 Marks

SECTION - A (5x6=30 marks)

Answer ALL Questions

ALL Questions carry EQUAL Marks

(Q.No 1 to 5 Either Or type)

(One question from each Unit)

SECTION - B (5x8=40 Marks)

Answer ALL Questions

ALL Questions carry EQUAL Marks

(Q.No 6 to 10 Either Or type)

(One question from each Unit)

Course Code:	20ELP01	Course Title						Batch:	2020-2021 & Onwards
		Digital and Network Communication						Semester:	I
Hrs/Week:	5	L	5	T	-	P	-	Credits:	5

COURSE OBJECTIVES

1. Students can understand the building blocks of digital communication system.
2. Students can get exposure and implement on various modulation schemes.
3. Understand the transmission of data in digital and analog communication.
4. Able to analyze different types of protocols used in network architecture and standards.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Illustrate and analyze the performance of different modulation techniques.	K1
CO2	Understand and focus on different types of digital modulation schemes.	K2
CO3	Define and illustrate the concept of analog and digital transmission of data.	K3
CO4	Examine and explain the functions of various layers and infer the functions of asynchronous Protocols and working of LAN standards	K4

SYLLABUS

20ELP01	Digital and Network Communication	Sem: I
Unit No.	Topics	Hours
I	Signal Digitization Sampling Theorem – Pulse Amplitude Modulation – Pulse Position Modulation – Pulse Width Modulation – Pulse Code Modulation – Quantization: Quantization Noise – Delta Modulation: Adaptive Delta Modulation – Signal Power – Signal to Quantization Noise Ratio – PCM and DM Voice Signal Comparison – Time Division Multiplexing – CCITT.	13
II	Digital Radio Digital Radio Block Diagram – Digital Modulation: Amplitude Shift Keying – Frequency Shift Keying – Phase Shift Keying – Binary Phase Shift Keying – Quadrature Phase Shift Keying – Quadrature Amplitude Modulation – Digital Demodulation: Coherent Demodulation – Coherent Detection – FSK Demodulator – BPSK Demodulator – QPSK Demodulation – QAM Demodulation.	13

III	Data Communication Introduction – Basic Terms and Concepts – Line Configurations – Topology – Transmission Media – MODEM: Standard and Types – Analog and Digital transmission: Encoding and Modulating – Channel Capacity – Base Band and Broad Band – Transmission Impairments – Multiplexing: FDM – TDM – Error Detection and Control: CRC.	10
IV	Network Architecture and Protocols Layered Architecture – OSI model – Functions of Layers – Data Link Control Protocols – ARQ – Stop and Wait – Sliding Window – Go back N and Selective Repeat – Asynchronous Protocol: X Modem – Y Modem– Kermit – Synchronous Protocol: BSC– SDLC – HDLC– TCP/IP Model – SMTP – HTTP – FTP.	12
V	LAN and ISDN LAN: Standard, Protocol – IEEE 802 Standards: ETHERNET – LLC – MAC – CSMA/CD – Token Ring – Token Bus – FDDI –ALOHA– SONET – ISDN: IDN – Channels – User Interfaces – ISDN Layers – Broad Band ISDN – Frame Relay – ATM: Concept and Architecture – ISDN Protocol– Physical Layer Protocol – D-channel Data Link Layer – Layer 3 Protocols– Network Signaling Systems: SS7 Protocol.	12

Teaching methods: < Lecturing, Lecture imposed with questions, PowerPoint Projection through LCD, Assignment, Discussion, Seminar, Buzzles and Quiz>

TEXT BOOKS

1. Harold Kolimbiris, "Digital Communication Systems with Satellite and Fiber Optics Applications", Pearson Education, Third Indian Reprint, 2004. (Unit –I&II)
2. Behrouz A.Forouzan, "Data Communication and Networking", Tata McGraw Hill, fourth Edition, 2000. (Unit – III, IV and V)

REFERENCE BOOKS

1. John G. Proakis, "Digital Communications", McGraw–Hill Higher Education, fourth Edition, 2000.
2. Ulysess Black, "Data Communications and Distributed Networks", III Edition, 2012.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/106/105/106105082/>
<https://nptel.ac.in/courses/117/101/117101051/>


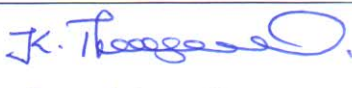
MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	M	M
CO4	S	M	L	L

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Dr. R. PREMA Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Curriculum Development Cell Hindusthan College of Arts & Science Name & Signature

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Coimbatore-641 028.

Course Code:	20ELP02	Course Title						Batch:	2020-2021 & Onwards
		Microwave and RADAR Navigation System						Semester:	I
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES

1. To enable the students to learn the operations of wave equation.
2. To get deep knowledge in Microwave Device and Circuits.
3. To get thorough knowledge about uses of microwave amplifiers and oscillators.
4. Can get exposure on wave guides and microwave antennas and RADAR systems.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember and illustrate the applications of wave equations	K1
CO2	Understand and explain the working of various microwave devices	K2
CO3	Identify and categorize the working of microwave amplifiers and oscillators	K3
CO4	Analyze the performance of waveguides and various antennas and working of RADAR system and its applications	K4

SYLLABUS

20ELP02	Microwave and RADAR Navigation System	Sem: I
Unit No.	Topics	Hours
I	EM Wave Theory Introduction to Microwaves: History – Region and Band Designations– Advantages – Applications – Maxwell’s Equations: Ampere’s Law – Faraday’s Law – Gauss Law–Wave Equations – TEM/TE/TM/HE Wave Definitions –Transmission Lines - Two wire parallel transmission lines – Voltage and current relationship on transmission lines.	12
II	Microwave Devices Classification of Solid-State Microwave Devices – Varactor Diodes – PIN Diode–Schottky Barrier Diode (SBD) – Tunnel Diode –Gunn Diode – IMPATT Diode–TRAPATT Diode–BARITT Diodes – Quantum Electronic Devices.	12

III	<p>Microwave Amplifiers and Oscillators Klystrons: Two Cavity Klystron Amplifier–Multicavity Klystron– Reflex Klystron–Traveling Wave Tube (TWT): Construction– Operation– Backward Wave Oscillator – Magnetrons: Cavity Magnetron Operation– Sustained Oscillations in Magnetron– Applications.</p>	12
IV	<p>Waveguides and Microwave Antennas Types of Waveguides– Propagation of Waves in Rectangular Waveguides– TE and TM Modes–Propagation of TM Waves in Rectangular Waveguide– TM Modes in Rectangular Waveguides. Horn Antenna: Sectoral E & H–plane Horn– Pyramidal Horn and Conical Horn – Parabolic Reflector: Feed for Parabolic Reflector – Lens Antenna – Slot Antenna – Micro Strip Antenna: Operation – Methods of Analysis – Polarization – Dual frequency.</p>	12
V	<p>RADAR Block Diagram – Classification: Doppler – Pulsed – Free Space RADAR Range Equation – Maximum Unambiguous Range –RADAR Receivers – Modulators – RADAR Displays: Plan Position Indicator (PPI) – Doppler Effect – CW Doppler RADAR – Moving Target Indicator (MTI) RADAR– Frequency Modulated CW RADAR – Radio Navigational Aids: Long Range Navigational Aid (LORAN).</p>	12

Teaching methods: < Lecturing, Lecture imposed with questions, PowerPoint Projection through LCD, Assignment, Discussion, Seminar, Buzzles and Quiz>

TEXT BOOK

1. Dr. Kulkarni. M, “Microwave and Radar Engineering”, Umesh Publications, Fifth Revised Edition, 2015. (Unit –I to V)

REFERENCE BOOKS

1. Prasad K. D, “Antenna and Wave Propagation”, Sathya Prakashan Publication, Third Edition, Reprint, 2004.
2. Merrill I. Skolnik, “Introduction to RADAR Systems”, Tata McGraw–Hill, Third Edition, Fifth Reprint, 2002.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/108/103/108103141/>
<https://nptel.ac.in/courses/108/105/108105154/>


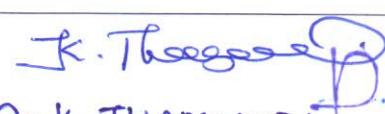

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	M
CO3	S	M	S	S
CO4	S	M	M	M

S-Strong, M- Medium, L – Low

Follows common pattern of Internal and External assessment, suggested in the Regulations.

ASSESSMENT PATTERN (if deviation from common pattern)

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Ms. MAHITHA MOHAN Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Name & Signature Curriculum Development Cell

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science,
 Coimbatore-641 028

Hindusthan College of Arts & Science,
 Coimbatore-641 028.

Course Code:	20ELP03	Course Title						Batch:	2020-2021 & Onwards
		8051 Microcontroller with C Programming						Semester:	I
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES

1. To enable the Students to learn the architecture and instruction sets.
2. To express the concepts of programming and Interfacing concepts of 8051 Microcontroller.
3. To understand the assembly and C language programs.
4. Able to use interrupts, serial communication and programming concepts for real time applications.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOM S LEVEL
CO1	Recall and devise the fundamentals of microprocessors and architecture of 8051	K1
CO2	Understand and estimate the assembly and C language programming concepts of 8051	K2
CO3	Compute the function of interrupts and serial communication in real world applications	K3
CO4	Analyze different types of external interfaces including LEDS, LCD, Keypad, Matrix, Switches & Seven segment display and programming concepts of real time applications	K4

SYLLABUS

20ELP03	8051 Microcontroller with C Programming	Sem: I
Unit No.	Topics	Hours
I	Overview of 8051 Introduction to Computing – Microprocessor and Microcontrollers – Microcontrollers and Embedded Processors – Overview of 8051 Family – 8051 Architecture – Timers – Registers and Memory Organizations.	12
II	8051 Assembly Language Programming Inside the 8051 → Pin Out – Instruction Set: Addressing Modes – Data Transfer Instruction – Logical Instruction– Arithmetic Instructions – Jump and Call Instructions –Bit Oriented Instructions – Flags and Stack.	12
III	Programming with C Data Types – Time Delay Programming – I/O Programming – Logic Operations – Arithmetic Operations – Timer Programming – Counter Programming.	12

IV	8051 Interrupts & Peripherals 8051 Interrupts – Programming External Hardware Interrupts – 8051 Serial Communication Programming – Programming with Serial Communication Interrupts – Peripheral and Interrupt Programming in C.	12
V	Real World Applications and Case Studies LCD Interfacing – Keyboard Interfacing – Parallel and Serial ADC Interfacing – DAC Interfacing – Sensor Interfacing and Signal Conditioning – RTC Interfacing – Relays and Opto-Isolator Interfacing – Stepper Motor Interfacing – DC Motor Interfacing and PWM.	12

Teaching methods: < Lecturing, Lecture imposed with questions, PowerPoint Projection through LCD, Assignment, Discussion, Seminar, Buzzles and Quiz >

TEXT BOOK

1. Muhammad Ali Mazidi, Janice GillispieMazidi and Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems Using Assembly and C" by PHI, 2nd Edition, 2006. (Unit –I to V)

REFERENCE BOOK

1. Kenneth J. Ayala, "The 8051 Microcontroller", Delmar Cengage Learning, 3rd Edition, 2004.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/108/105/108105102/>
<https://nptel.ac.in/courses/117/104/117104072/>


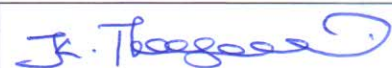

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	S
CO4	S	S	S	S

S-Strong, M- Medium, L – Low

Follows common pattern of Internal and External assessment, suggested in the Regulations.

ASSESSMENT PATTERN (if deviation from common pattern)

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Ms. M. KUMARESAN Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Coordinator Name & Signature Hindusthan College of Arts & Science, Coimbatore-641 028.

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science,
 Coimbatore-641 028

Course Code:	20ELP04	Course Title						Batch:	2020-2021 & Onwards
		Power Electronics						Semester:	I
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES

1. To impart the knowledge of different types of Power Semiconductor Devices
2. To get exposure on switching characteristics and applications.
3. To enable the students to work with static switches and voltage controllers.
4. Can able to design inverters, power supplies and regulators to become an entrepreneur.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Recognize and explain the fundamental concepts of power electronic devices.	K1
CO2	Explain the working of controlled rectifiers and regulators.	K2
CO3	Analyze the working of static switches and voltage controllers	K3
CO4	Evaluate the operation of inverters and power supplies for industrial needs, UPS, battery charger.	K4

SYLLABUS

20ELP04	Power Electronics	Sem: I
Unit No.	Topics	Hours
I	Power Electronic Devices Introduction – Power Semiconductor Devices: Power Diodes – Power Transistors: Power MOSFET – Insulated Gate Bipolar Transistor (IGBT) – Thyristors: SCR, TRIAC – Other Power Electronic Devices: SIT– MCT– PUT–SCS–SUS–GTO–SITH.	12
II	Controlled Rectifiers Controlled Rectifiers: Phase Controlled Converter – Single–Phase Semi Converter – Single–Phase Series Converter – DC Choppers: Step Down Operation: Step Down with RL Load –Step Up Operation – Switch Mode Regulator: Buck Regulator – Boost Regulator – Buck–Boost Regulator – CUK Regulator.	12

III	Static Switches & AC Voltage Controllers AC Switches : Single Phase –Three Phase – Three Phase Reversing Switches – AC Switches for Bus Transfer – DC Switches– Solid State Relays – AC Voltage Controller: ON–OFF Control –Phase Control – Single Phase Bidirectional Controllers: Resistive Loads – Inductive Loads– Cyclo Converters: Single Phase Cyclo Converters.	12
IV	Inverters Single Phase Bridge Inverters – Three Phase Inverters – Voltage Control: Single PWM –Multiple PWM –Sinusoidal PWM – Phase Displacement Control – 60–Degree PWM – Third–Harmonic PWM.	12
V	Power Supplies DC Power Supplies: Switched Mode – Resonant – Bidirectional – AC Power Supplies: Switched Mode – Resonant – Bidirectional – UPS – Static Circuit Breakers – Battery Charger – Emergency Lighting System.	12

Teaching methods: < Lecturing, Lecture imposed with questions, PowerPoint Projection through LCD, Assignment, Discussion, Seminar, Buzzles and Quiz>

TEXT BOOK

1. Rashid .M.H, “Power Electronics – Circuits, Devices and Applications”, Third Edition, Prentice Hall, 2011.(Unit –I to V)

REFERENCE BOOK

1. Dr.Bimbhra.P.S, “Power Electronics”, Khanna Publishers, Fifth Edition, 2014.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/108/105/108105066/>
<https://nptel.ac.in/courses/108/102/108102145/>



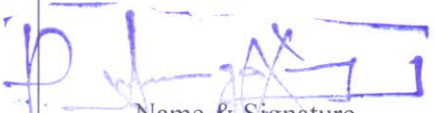
MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	S
CO3	S	S	S	S
CO4	S	S	S	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Dr. K. THANGAVEL Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Name & Signature

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 026

Coordinator
 Curriculum Development Cell
 Hindusthan College of Arts & Science,
 Coimbatore-641 028.

Course Code:	20ELP05	Course Title						Batch:	2020-2021 & Onwards
		Practical I: Digital Communication Systems						Semester:	I
Hrs/Week:	5	L	-	T	-	P	5	Credits:	3

COURSE OBJECTIVES

1. To impart the knowledge on implementation of baseband modulation techniques.
2. To enable the students to work on various modulation technologies.
3. Can able to design different types of modulation process.
4. Able to get thorough knowledge about delta and quadrature modulation and demodulation techniques.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand and analyze the implementation of base band modulation techniques	K1
CO2	Evaluate PCM and DM concept to design digital communication system.	K2
CO3	Analyze the working of various pulse modulation schemes	K3
CO4	Design various digital modulators and demodulators for implementing digital communication	K4

SYLLABUS

20ELP05	Practical I: Digital Communication Systems	Sem: I
Experiment No.	Topics (Any 10 Experiments)	Hours
1	PAM Generation and Detection	
2	PWM Generation and Detection	
3	PPM Generation and Detection	
4	Frequency Sampling	
5	Pulse Code Modulation and Demodulation	
6	Linear Pulse Code Modulation and Demodulation	

7	ASK Generation and Detection	
8	FSK Generation and Detection	
9	PSK Generation and Detection	
10	QPSK Generation and Detection	
11	DPSK Generation and Detection	
12	BPSK Generation and Detection	
13	QAM Generation and Detection	
14	Delta Modulation and Demodulation	
15	Adaptive Delta Modulation and Demodulation	

Teaching methods: < Practical Demonstaration >

TEXT BOOK

1. Harold Kolimbiris, "Digital Communication Systems with Satellite and Fiber Optics Applications", Pearson Education, Third Indian Reprint, 2004.

REFERENCE BOOK

1. John G. Proakis, "Digital Communications", McGraw-Hill Higher Education, fourth Edition, 2000.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/108/104/108104098/>
<https://nptel.ac.in/courses/117/101/117101051/>




MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	S
CO4	S	S	S	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Dr. R. PREMA Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Name & Signature

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Curriculum Development Cell
 Hindusthan College of Arts & Science
 Coimbatore-641 028.

Course Code:	20ELP06	Course Title						Batch:	2020-2021 & Onwards
		Practical II: 8051 Microcontroller and its Applications						Semester:	I
Hrs/Week:	5	L	-	T	-	P	5	Credits:	3

COURSE OBJECTIVES

1. To impart the outline of the practical skills for developing own ALP.
2. To understand C program for real world applications using 8051 microcontrollers.
3. Can design various embedded system products.
4. Distinguish between various types of code converters and to interpret the designing of programs based on real time applications.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember and differentiate basic programming concepts of 8051 μ C	K1
CO2	Understand and evaluate the data transfer operation through serial and parallel ports	K2
CO3	Analyze ADC & DAC interfacing with 8051 μ C	K3
CO4	Estimate various embedded system products to solve real time problems using 8051 μ C	K4

SYLLABUS

20ELP06	Practical II: 8051 Microcontroller and its Applications	Sem: I
Experiment No.	Topics (Any 10 Experiments)	Hours
1	Arithmetic and Logic Operations	
2	Data Transfer with Parallel Port	
3	PWM Generation	
4	Solid State Relay Interface using Interrupt	
5	Interfacing Matrix Keypad	
6	Seven Segment Display Interface	
7	LCD Interface	
8	Data Transfer with Parallel Port	

9	DAC Interface	
10	ADC Interface	
11	Stepper Motor Interface	
12	Serial Communication Interface	
13	Digital Clock	
14	Traffic Light Controller	
15	Water Level Controller	

Teaching methods: < Practical Demonstaration >

TEXT BOOK

1. Muhammad Ali Mazidi, Janice GillispieMazidi and Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems Using Assembly and C" by PHI, 2nd Edition, 2006.

REFERENCE BOOK

1. Kenneth J. Ayala, "The 8051 Microcontroller", Delmar Cengage Learning, 3rd Edition, 2004.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/106/108/106108100/>
<https://nptel.ac.in/courses/108/105/108105102/>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	M
CO3	S	S	S	S
CO4	S	M	S	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Mr. M. KUMARESAN Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Name & Signature Curriculum Development Cell

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Hindusthan College of Arts & Science,
 Coimbatore-641 028.

Course Code:	20ELP07	Course Title						Batch:	2020-2021 & Onwards
		Optical Fiber Communication						Semester:	II
Hrs/Week:	5	L	5	T	-	P	-	Credits:	5

COURSE OBJECTIVES

1. To facilitate the knowledge about Optical Fiber Fabrication,
2. To understand the characteristics of Optical Sources & detectors
3. To determine the signal distortion and bending loss of signals.
4. To impart knowledge on Optical sources, detectors and network applications.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Enumerate and focus on the fabrication process of optical fibers	K1
CO2	Classify the types of optical fibers	K2
CO3	Apply and distinguish the characteristics of single mode fibers	K3
CO4	Analyze the function of various light sources and detectors, optical fibers in SONET.	K4

SYLLABUS

20ELP07	Optical Fiber Communication	Sem: II
Unit No.	Topics	Hours
I	Optical Fiber Fabrication Motivation for Light Wave Communications – Optical Spectral Bands – Nature of Light – Basic Optical Laws – Fiber Materials – Fiber Fabrication: Classification – Chemical Vapor Deposition – Multi- Element Glasses – Phasil System – Comparisons of Various Fabrication Processes – Drawing and Coating – Double Crucible Method – Rod-In Tube Method – Mechanical Properties.	10
II	Optical Fibers and their Properties Basic Structure of Optical Fiber –Conditions for Total Internal Reflection– Principles of light propagation – Types of fibers: Step Index & Graded Index fibers – Modes* of Propagation: Single and Multimode– Calculation of Acceptance Angle –Numerical Aperture –Advantages and Application.	10

III	<p>Signal Degradation Attenuation – Absorption – Scattering & Bending losses – Core & Cladding losses – Signal distortion in Fibers – Modal Delay – Factors contributing to dispersion – Group delay – Material & Waveguide dispersion – Signal distortion in Single Mode Fibers – Polarization mode dispersion – Characteristics of single mode fiber – Cut-off wavelength – Mode – Field Diameter – Single mode fiber bending loss – Dispersion power penalty – Total dispersion delay – Maximum transmission rate – Dispersion shifted fiber.</p>	15
IV	<p>Light Sources and Photo Detectors Light Sources: LED –Fiber LED Coupling –LASERS –Operation types– Spatial Emission– Current v/s output characteristics. Photo Detectors: Characteristics – Photo Emissive Type –Photo Conductive –Photo Voltaic Devices –PIN Photo diode –Avalanche Photo Diode.</p>	15
V	<p>Optical Networks & Applications Wave Length Division Multiplexing – Dense WDM – Digital Subscriber Line Technology – SONET/SDH: SONET Network Layers –Frame Format– SONET Multiplexing – SONET Topologies – SDH – Community Antenna Television (CATV) –Special Applications: Digital Video Transmission Using Optical Fibers networks receiver – High performance receiver–Design of fiber optic receiver– Fiber based MODEMS.</p>	10

Teaching methods: < Lecturing, Lecture imposed with questions, PowerPoint Projection through LCD, Assignment, Discussion, Seminar, Buzzles and Quiz>

TEXT BOOKS

1. Gerd Keiser, "Optical Fiber Communications", TMH, fourth Edition, 10th Reprint, 2011. (Unit-I to IV)
2. Subir Kumar Sarkar, "Optical Fibres and Fibre Optic Communication Systems"
3. S. Chand & Comp. (Unit-V)

REFERENCE BOOK

1. Robert J Schoenbeck "Electronic Communications Modulation and Transmission", PHI, 1999.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/108/104/108104113/>
<https://nptel.ac.in/courses/117/101/117101054/>


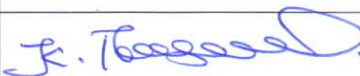

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	M	M
CO3	S	S	M	S
CO4	S	M	S	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Do. R. PREMA Name & Signature of the Staff	 Do. K. THARUNAVEL Name & Signature	 Name & Signature

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science,
 Coimbatore-641 028

Curriculum Development Cell
 Hindusthan College of Arts & Science
 Coimbatore-641 028.

Course Code:	20ELP08	Course Title						Batch:	2020-2021 & Onwards
		MEMS and Control Systems						Semester:	II
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES

1. To learn the concept of MEMS and micro systems.
2. To impart knowledge on Control systems and thermal systems.
3. To correlate and apply the same in open and closed loop systems.
4. To differentiate time and frequency domain responses and working characteristics of PID controllers.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Recall and categorize the concepts of MEMS and multidisciplinary nature of Microsystems	K1
CO2	Understand and evaluate the working of micro sensors	K2
CO3	Estimate the concept of control system in electrical and thermal systems	K3
CO4	Analyze the time and frequency-domain responses of first, second-order systems and stability analysis of control systems	K4

SYLLABUS

20ELP08	MEMS and Control Systems	Sem: II
Unit No.	Topics	Hours
I	Overview of MEMS & Micro System MEMS & Micro systems - typical MEMS & Micro system products – Evaluation of Micro fabrication – Microsystems and Microelectronics – The Multidisciplinary nature of Micro Systems design and Manufacture – Micro Systems and miniaturization – applications of Micro Systems in Automotive industry – applications of Microsystems in other industries.	10
II	Working Principles of Microsystems Micro sensors – Micro actuation using Thermal Forces – Actuation Using shape memory Alloys – Actuation Using Piezoelectric crystals – Actuation using Electrostatic forces – MEMS with Micro Actuators – Micro Accelerometers – Micro Fluidics.	10

III	Concepts of Control Systems Introduction to control systems-Human elements in control systems- block diagram fundamentals- open loop control system-closed loop control systems- Linear and Nonlinear Systems- Effect of feedback on Overall gain, Stability, Sensitivity and Noise-Physical system representation: Electrical Systems and thermal system.	15
IV	Block Diagrams, Signal Flow Graphs and Time Response Analysis Introduction to Block Diagrams-Block diagram reduction-Signal flow graph-Signal flow graph algebra-construction of signal flow graph from block diagram- Mason's gain formula-Time Response Analysis of First and second order systems-Steady state error.	15
V	Stability Analysis, Compensation and Controllers Stability Analysis of Control System: Bode plot- Routh Hurwitz criterion- Root Locus-Nyquist Criterion- Principles of P-PI-PD-PID Controllers- Cascade and feedback compensation, lag, lead, lag-lead Compensation.	10

Teaching methods: < Lecturing, Lecture imposed with questions, PowerPoint Projection through LCD, Assignment, Discussion, Seminar, Buzzles and Quiz>

TEXT BOOKS

1. Tai Ran Hsu – *MEMS & Micro systems Design and Manufacture* – Tata McGraw Hill. (Unit I & II)
2. S.N. Verma, "Automatic Control Systems", Khanna Publishers. (Unit III)
3. A. NagoorKani, "Control Systems", RBA Publications. (Unit IV & V)

REFERENCE BOOKS

1. Katsuhiko Ogata "Modern Control Engineering". Pearson Education Asia, Fourth edition, 2002.
2. Benjamin C.Kuo "Automatic Control Systems", PHI, 1995.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/117/105/117105082/>
<https://nptel.ac.in/courses/108/101/108101037/>
<https://nptel.ac.in/courses/108/106/108106098/>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	M	S
CO4	S	S	M	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Ms. MAHITHA MOHAN Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Name & Signature

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Curriculum Development Cell
 Hindusthan College of Arts & Science,
 Coimbatore-641 028.

Course Code:	20ELP09	Course Title						Batch:	2020-2021 & Onwards
		Embedded Systems and RTOS						Semester:	II
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES

1. To enable the students to recall the basics of RTOS.
2. To become familiar with PIC microcontroller in embedded systems.
3. To get thorough knowledge on peripheral devices of PIC microcontrollers.
4. To understand architecture of embedded systems, real time operating systems and applications.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand and classify the fundamentals of Embedded System	K1
CO2	Categorize the instruction sets used in architecture	K2
CO3	Apply and estimate the peripheral features used in microcontroller	K3
CO4	Explain the characteristics of Embedded software architecture, memory management and real time operating systems	K4

SYLLABUS

20ELP09	Embedded Systems and RTOS	Sem: II
Unit No.	Topics	Hours
I	Embedded Systems Definition and Classification – Overview of Embedded Controllers – Exemplary High Performance Processors – CISC and RISC Architecture– Hardware Unit in an Embedded System– Software Embedded into a System – Exemplary Applications – Embedded Systems on a Chip in VLSI circuit.	10
II	PIC 16F877 Architecture and Instruction Set Device Overview – Architecture – Memory Organization – Status Register– Option Register – INTCON Register – PCON Register – I/O Ports– Data EEPROM – Instruction Set: Byte Oriented Operations – Bit Oriented Operations– Literal and Control Operations.	15

III	PIC Peripheral Features TIMER0 Module – TIMER1 Module – TIMER2 Module – Capture/ Compare/ PWM Modules – I ² C transmission and reception – USART – ADC Module – Special features of the CPU : Oscillator Selection – Power on Reset – Power up Timer – Oscillator Startup Timer – Brownout Reset– Interrupts – Watchdog Timer –SLEEP.	10
IV	Embedded Software Architecture & Operating System Services Round Robin – Round Robin with Interrupts – Function Queue Scheduling Architecture– Real Time Operating Systems (RTOS) – Tasks and Data – Semaphores and Shared Data– Message Queues, Mail Box and Pipes – Timer Function – Events – Memory Management.	15
V	Real Time Operating Systems Study of Micro C/OS–II – Vx Works – Other Popular RTOS – RTOS System Level Functions – Task Service Functions – Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions – Mailbox Related Functions – Queue Related Functions – Case Studies of Programming with RTOS: Case Definition, Multiple Tasks and their Functions – Creating a list of Tasks, Functions and IPCs – Exemplary Coding Steps.	10

Teaching methods: < Lecturing, Lecture imposed with questions, PowerPoint Projection through LCD, Assignment, Discussion, Seminar, Buzzles and Quiz>

TEXT BOOKS

1. Rajkamal, *Embedded Systems Architecture, Programming and Design*, TATA McGraw–Hill, First Reprint, 2003. (Unit-I)
2. Martin.P.Bates, “*Programming 8–bit PIC Microcontrollers in C Interactive Hardware Simulation*”, Elsevier, Second Edition, 2008. (Unit II & III)
3. David E. Simon, “*An Embedded Software Primer*”, Addison Wesley, Ninth Impression, 2011. (Unit IV & V)

REFERENCE BOOKS

1. Shibu KV, “*Introduction to Embedded System*” Tata McGraw Hill, 2010.
2. *Micro C OS II Reference Manual, Salvo User Manual & VX works Programmers Manual.*
3. *PIC 16f877A Data Sheet.*

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/108/102/108102045/>
<https://nptel.ac.in/courses/108/105/108105057/>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	S
CO4	S	M	S	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 M. M. KUMARESAN Name & Signature of the Staff	 Dr. K. THIAGARAVEL Name & Signature	 Name & Signature Coordinator Curriculum Development Cell

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Hindusthan College of Arts & Science,
 Coimbatore-641 028.

Course Code:	20ELP10	Course Title						Batch:	2020-2021 & Onwards
		Digital System Design Using VHDL						Semester:	II
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVES

1. To impart the concepts of digital circuit design using VHDL
2. To equip the students to develop new digital systems.
3. To apply the concept of behavioral and structural modeling of VHDL.
4. To enable the students to differentiate the types of PLD's and to estimate design examples used in VHDL.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Recall and analyze the functionality of combinational and sequential circuit design	K1
CO2	Evaluate the sequential statements used in VHDL	K2
CO3	Classify the specifications of modeling registers and counters	K3
CO4	Differentiate the characteristics of programmable logic devices and design examples	K4

SYLLABUS

20ELP10	Digital System Design Using VHDL	Sem: II
Unit No.	Topics	Hours
I	Digital Logic Design Combinational Logic – Boolean Algebra and Algebraic Simplification – Karnaugh Maps – Designing with NAND and NOR Gates – Flip-Flops and Latches – Mealy Sequential Circuit Design – Moore Sequential Circuit Design – Sequential Circuit timing – Tristate Logic and Busses.	12
II	VHDL Computer Aided Design – HDL – VHDL Description of Combinational Circuits – VHDL Modules – Sequential Statements – Modeling of Flip-Flops – Wait Statement and Delays – Data Types and Operators – VHDL Libraries.	12
III	VHDL Modeling Modeling Registers and Counters using VHDL Process Statement – Behavior and Structural Modeling – Variables, Signals and Constants – Arrays – Loops in VHDL – Assert and Report Statement.	12

IV	Programmable Logic Devices Overview of PLD – Simple Programmable Logic Devices – Complex Programmable Logic Devices (CPLD) – Field Programmable Gate Arrays (FPGA).	12
V	Design Examples BCD to Seven Segment Display Decoder– Adders – Traffic Light Controllers – State Graphs for Control Circuits – Score Board and Controller – Synchronization and Denouncing – Multiplier – Keypad Scanner – Binary Divider.	12

Teaching methods: < Lecturing, Lecture imposed with questions, PowerPoint Projection through LCD, Assignment, Discussion, Seminar, Buzzles and Quiz>

TEXT BOOK

1. Charles H. Roth, Jr. Lizy Kurian John, "Digital System Design Using VHDL" Cengage Learning, First Indian Reprint, 2012. (Unit-I to V)

REFERENCE BOOKS

1. Bhaskar.J, "VHDL Primer", PHI, Low price Edition, 2001.
2. Douglas L. Perry, "VHDL Programming by Example" Tata Mc-Graw-Hill, Fourth Edition, 2002.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/117/108/117108040/>
<https://nptel.ac.in/courses/106/102/106102181/>


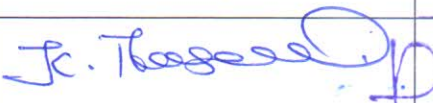

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	M	S
CO3	S	S	M	M
CO4	S	S	S	S

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Ms. MAHITHA MOHAN Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Coordinator Name & Signature Curriculum Development Cell

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Hindusthan College of Arts & Science,
 Coimbatore-641 028.

Course Code:	20ELP11	Course Title						Batch:	2020-2021 & Onwards
		Practical III: Optical and Microwave Communication						Semester:	II
Hrs/Week:	5	L	-	T	-	P	5	Credits:	3

COURSE OBJECTIVES

1. To impart the knowledge of establishing optical and microwave communication.
2. To get familiar with bending and coupling losses occur in fibers.
3. To get strong knowledge about characteristics of reflex klystron and Gunn diode oscillator.
4. To understand the performance of microwave components and microwave devices.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand and classify the working of analog and digital optical communication system	K1
CO2	Characterize the Attenuation, Bending and Coupling Loss of optical fibers	K2
CO3	Demonstrate and identify the characteristics of Reflex Klystron and Gunn Diode Oscillator	K3
CO4	Characterize the performance of various microwave components devices	K4

SYLLABUS

20ELP11	Practical III: Optical and Microwave Communication	Sem: II
Experiment No.	Topics (Any 10 Experiments)	Hours
1	Study of Fiber Optic Traine	
2	Establishment of Analog Fiber Optic Link	
3	Establishment of Digital Fiber Optic Link	
4	Measurement of Attenuation Loss	
5	Measurement of Bending Loss	
6	Measurement of Coupling Loss	
7	Study of Microwave Components and Instruments	

8	Reflex Klystron Characteristics	
9	Frequency Measurement of Reflex Klystron	
10	VSWR Measurement	
11	Attenuator Characteristics	
12	Study of Gunn Diode Oscillator	
13	Measurement of Unknown Load Impedance	
14	Isolator and Circulator Characteristics	
15	Horn Antenna Characteristics	

Teaching methods: < Practical Demonstration >

TEXT BOOKS

1. Gerd Keiser, "Optical Fiber Communications", TMH, fourth Edition, 10th Reprint, 2011.
2. Dr. Kulkarni. M, "Microwave and Radar Engineering", Umesh Publications, Fifth Revised Edition, 2015. (Unit -I to V)

REFERENCE BOOKS

1. Subir Kumar Sarkar, "Optical Fibres and Fibre Optic' Communication Systems"
S. Chand & Comp. (Unit-V)

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/108/104/108104113/>
<https://nptel.ac.in/courses/108/103/108103141/>




MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	S	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Dr. R. PREMA Name & Signature of the Staff	 Dr. K. THANAVEL Name & Signature	 Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Course Code:	20ELP12	Course Title						Batch:	2020-2021 & Onwards
		Practical IV: Embedded System and RTOS						Semester:	II
Hrs/Week:	5	L	-	T	-	P	5	Credits:	3

COURSE OBJECTIVES

1. To impart the knowledge of developing own embedded systems for various applications.
2. To understand the interfacing concept of various peripherals.
3. To know the design concepts on seven segment display.
4. To get familiar with converters, stepper motor and other interfacing concepts.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Recall and analyze the basic programming concepts	K1
CO2	Understand and estimate the interfacing concept of various peripherals with embedded microcontroller	K2
CO3	Analyze the data transfer information through serial and parallel ports	K3
CO4	Construct and interpret various real world applications of Embedded Systems	K4

SYLLABUS

20ELP12	Practical IV: Embedded System and RTOS	Sem: II
Experiment No.	Topics (Any 10 Experiments) (Using PIC 16F84A IC/ PIC 16F877 Kit/ RTOS Kit)	Hours
1	Delay Generation using Timer	
2	PWM Generation	
3	LED Interfacing and Object Counter	
4	Interfacing Solid State Relay	
5	Interfacing Seven Segment Display	
6	LCD Interface	

7	DAC Interface	
8	Internal ADC Programming	
9	External Event Counter using Timer-1	
10	Programming using interrupts	
11	Serial Port Interfacing Using RS232	
12	Water Level Controller	
13	Stepper Motor Interface	
14	RTOS Multi tasking	
15	Temperature Monitoring and Control	

Teaching methods: < Practical Demonstaration >

TEXT BOOK

1. Muhammad Ali Mazidi, Janice GillispieMazidi and Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems Using Assembly and C" by PHI, 2nd Edition, 2006.

REFERENCE BOOK

1. Kenneth J. Ayala, "The 8051 Microcontroller", Delmar Cengage Learning, 3rd Edition, 2004.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/106/108/106108100/>
<https://nptel.ac.in/courses/108/105/108105102/>


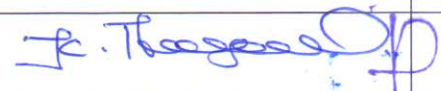

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	S	M
CO4	S	S	M	M

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Mrs. S. SATHYADEEPA Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Name & Signature

Head of the Department,
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Curriculum Development Cell
 Hindusthan College of Arts & Science,
 Coimbatore-641 028.

Course Code:	20ELP13	Mobile Communication						Batch:	2020-2021 & Onwards
Hrs/Week:	5	L	5	T	-	P	-	Semester:	III
								Credits:	5

COURSE OBJECTIVE

1. To make the students familiar with the Cellular Concept, Design and Wireless Network.
2. To impart knowledge about multiple access techniques.
3. To enable the students to know about wireless networks and fixed telephone network.
4. To get familiar with features of 4G networks.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the 2G, 3G and 4G cellular communication systems.	K1
CO2	Understand the proper multiple accessing methods depending on channel model.	K2
CO3	Allocate traffic channels for call processing	K3
CO4	Analyze the key performance metrics of a cellular communication system and design.	K4

SYLLABUS

20ELP13	Mobile Communication	Sem: III
Unit No.	Topics	Hours
I	Wireless Communication Systems Evolution – Paging Systems – Cordless and Cellular Telephone Systems – Trends in Cellular Radio and Personal Communications – Second Generation: 2.5G Mobile Radio Networks – TDMA Standards – IS-95B for 2.5G CDMA – Third Generation: W-CDMA – CDMA200 – TD- SCDMA – 4G features and challenges – Wireless Local Loop – Wireless Local Area Networks – Bluetooth and Personal Area Network.	13
II	Cellular Concept Introduction – Frequency Reuse – Channel Assignment Strategies – Handoff Strategies – Interference and System Capacity: Co-channel Interference and System Capacity – Channel Planning for Wireless Systems – Adjacent Channel Interference – Power Control for Reducing Interference – Trunking and Grade of Service – Improving Coverage & Capacity in Cellular Systems: Cell Splitting – Sectoring.	13

III	Multiple Access Techniques Multiple Access: FDMA – TDMA –SSMA – SDMA – Packet Radio: Protocols – CSMA – Reservation – Capture Effect – Capacity of Cellular Systems: Cellular CDMA.	13
IV	Wireless Networks Differences Between Wireless and Fixed Telephone Networks: Public Switched Telephone Network (PSTN), Limitations, Merging Wireless Networks and PSTN – Development of Wireless Networks – Fixed Network Transmission Hierarchy – Wireless Data Services – Personal Communication Services/Networks (PCS/PCNs) – Protocols for Network.	13
V	4G Networks 4G Vision – 4G Features and Challenges – Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart Antenna Techniques, OFDM–MIMO Systems, Adaptive Modulation and Coding with time slot scheduler, Cognitive Radio – Introduction to 5G Networks.	13

Teaching methods: < Lecturing, Lecture imposed with questions, PowerPoint Projection through LCD, Assignment, Discussion, Seminar, Buzzles and Quiz>

TEXT BOOKS

1. Vijay Garg, “Wireless Communications and Networking”, Elsevier, First Edition, 2007.
2. Stuber Gordon L , “Principles of Mobile Communication , Springer, Fourth Edition, 2014”

REFERENCE BOOKS

1. Theodore S. Rappaport, “Wireless Communications, Principles, Practice”, PHI, 2nd Edition, 2012.
2. William Stallings, “Wireless Communication and Networking”, PHI, 2nd Edition, 2003.
3. Mubashir Husain Rehmani, Riadh Dhaou “Cognitiye Radio, Mobile Communications and Wireless Networks”, Springer, 2019
4. GottapuSasibhushana Rao, “Mobile Cellular Communication”, Pearson, 2013.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/117/104/1171040>
<https://nptel.ac.in/courses/106/106/10610617>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	M	S	S
CO3	M	M	S	M
CO4	S	S	M	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Mrs. SATHYADEEPA S. Name & Signature of the Staff	 Dr. K. THANAVEL Name & Signature	 Coordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Course Code:	20ELP14	Course Title						Batch:	2020-2021 & Onwards
		Digital Signal Processing						Semester:	III
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVE

1. To impart Knowledge on the concept of Analyzing Continuous and Discrete Time Signals.
2. To get thorough knowledge on analysis of Z-transform.
3. Can able to get exposure about usage of digital filters.
4. To get familiar with the applications of speech processing and RADAR.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Enumerate the performance and frequency transforms for the signals.	K1
CO2	Understand to design DSP systems like FIR and IIR Filter etc.,	K2
CO3	Apply computer-based tools for engineering applications.	K3
CO4	Analyze the working of filters with required applications.	K4

SYLLABUS

20ELP14	Digital Signal Processing	Sem: III
Unit No.	Topics	Hours
I	Signals and Systems Introduction – Classification of Signals: Multichannel and Multi- dimensional signals, Continuous time and Discrete time signals, Analog and Digital Signals, Deterministic and Random Signals, Energy and Power Signals, Periodic and Non-Periodic Signals – Signal Processing Systems – Advantages of Digital Signal Processing – Elements of Digital Signal Processing System – Discrete Time Signals – Representation – Elementary Discrete Time Signals – Manipulation of Discrete Time Signals. Introduction to MATLAB – MATLAB Environment – MATLAB Operators.	13
II	Discrete Time Systems Basic Building Block – Classification – Linear Time Invariant (LTI) Systems – Convolution of Two Discrete Time Signals – Procedure for Computing Convolution Sum – Linear Convolution – Properties of Convolution Sum – Sampling of Continuous Time Signals.	13

III	Transform and Analysis Introduction – Z-Transform – Region of Convergence – Properties of Z-Transform – Causality and Stability – Discrete Time Fourier Transform – Convergence – Properties of DTFT: Periodicity, Linearity, Differentiation in Frequency Domain, Parseval's Relation.	13
IV	Digital Filters Introduction – Major Considerations in Using Digital Filters – Comparison Between Digital and Analog Filters – IIR and FIR Digital Filters – Realization Procedure for Digital Filters: Recursive, Non-recursive, FFT Realizations – Notch Filter – Comb Filter – All Pass Filters.	13
V	Applications Speech Processing: Speech Production Model – Channel Vocoder – Computer Voice Response System – Airborne Surveillance RADAR for Air Traffic Control (ATC) – Long Range Demonstration RADAR(LRDR).	13

Teaching methods: < Lecturing, Lecture imposed with questions, PowerPoint Projection through LCD, Assignment, Discussion, Seminar, Buzzles and Quiz >

TEXT BOOKS

1. Farooq Husain, "Digital Signal Processing", Umesh Publications, 3rd Edition, 2012.
2. Salivahanan . S, Vallavaraj. A, Gnanapriya. C, "Digital Signal Processing", Tata McGraw-Hill Publishing Company Limited, 13th Reprint, 2004.

REFERENCE BOOKS

1. Ramesh Babu. P, "Digital Signal Processing", Scitech Publications, 2nd Edition, 2003.
2. Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma, "MATLAB and its Applications in Engineering", Pearson, Eighth Impression.
3. Dimitris G Manolakis and John G Proakis, Pearson, "Digital Signal Processing : Principles, Algorithms And Applications", 4th Edition.
4. Lonnie C Ludeman "Fundamentals Of Digital Signal Processing", WILEY INDIA, Student Edition.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/108/101/108101174/>
<https://nptel.ac.in/courses/108/106/108106151/>

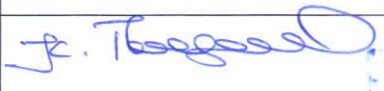
MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	M	S	M	M
CO4	S	M	M	M

S-Strong, M- Medium

Follows common pattern of Internal and External assessment, suggested in the Regulations.

ASSESSMENT PATTERN (if deviation from common pattern)

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Ms. MAHITHA MOHAN Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Co-ordinator Name & Signature

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Curriculum Development Cell
 Hindusthan College of Arts & Science
 Coimbatore-641 028.

Course Code:	20ELP15	Course Title						Batch:	2020-2021 & Onwards
		Modern VLSI Design						Semester:	III
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVE

1. To equip the students to learn about fabrication of active and passive components
2. Can able to design the process of VLSI circuit.
3. Can able to impart implementation of programmable logic devices.
4. To enable the students to get knowledge on design methodologies of ASIC.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember fabrication of passive and active electronics components.	K1
CO2	Understand the VLSI design flow and VLSI circuit design process.	K2
CO3	Assign the design flow of programmable logic devices.	K3
CO4	Audit the chip design issues and demonstrate the various design applications using ASIC.	K4

SYLLABUS

20ELP15	Modern VLSI Design	Sem: III
Unit No.	Topics	Hours
I	VLSI Fabrication Technology History of VLSI – Fabrication: MOSFET – Wafer Manufacture – Wafer Cleaning – Doping and Impurities Addition – Growth & Deposition of Dielectric Films – Masking and Lithography– Etching and Metallization– Packing – Fabrication of Passive Components – Process Flow for CMOS Fabrication – Twin Tub Process.	13
II	VLSI Design Flow VLSI Circuit Design Process – Design Flow – Architecture Specification and Design Constraints – HDL Capture and RTL Coding – Logic Simulation – Logic Synthesis – Logic Optimization – Formal Verification– Static Timing Analysis– Floor Planning – Placement& Routing – Layout Vs Schematic – Design Rule Check.	13
III	Programming Logic Devices Programmable Logic Array (PLA) – Programmable Array Logic (PAL) – Implementation Approaches in VLSI Design – Custom or FullCustom Design	13

	– Semicustom Design – Gate Arrays – Complex Programmable Logic Devices (CPLD) – CPLD Architectures.	
IV	Issues in Chip Design Requirements of Chip Design – System On Chip (SOC) – Chips Power Consumption – Clock – Chip Reliability – Analog Integration in the Digital Environment – CAD Systems – Layout Analysis – Case Study.	13
V	ASIC Design Chip Design – Design Methodologies: IBM ASICs– HP7100LC – Wiper Digital Video Chip – Kitchen Timer Chip: Specification and Architecture– Logic and Layout Design – Validation – Microprocessor Data Path: Clocking and Bus Design.	13

Teaching methods: < Lecturing, Lecture imposed with questions, PowerPoint Projection through LCD, Assignment, Discussion, Seminar, Buzzles and Quiz>

TEXT BOOKS

1. Lal Kishore.K, Prabhakar.V.S.V, "VLSI Design", I.K. International Publishing House Pvt. Ltd., 2010.(Unit I–IV)
2. Wolf.W, "Modern VLSI Design", Prentice Hall, 4th Edition, 2008.(UnitV)

REFERENCE BOOKS

1. Weste/Haris, "CMOS VLSI Design 4e: A circuits and systems perspective", Paperback – 1, Fourth Edition, 2015
2. Wayne Wolf, "Modern Vlsi Design: Ip-Based Design", 4th Edition, Pearson India, 2015
3. Jan M. Rabaey, University of California, Berkeley, "Digital, Integrated Circuits: A design perspective", Pearson Education India; Second edition, 2016

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/108/107/108107129/>
<https://nptel.ac.in/courses/117/105/117105137/>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	M	M	M	M
CO4	S	M	M	M

S-Strong, M- Medium

Follows common pattern of Internal and External assessment, suggested in the Regulations.

ASSESSMENT PATTERN (if deviation from common pattern)

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Dr. R. PREMA Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science Coimbatore-641 028. Name & Signature

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Course Code:	20ELP16	Course Title						Batch:	2020-2021 & Onwards
								Semester:	III
Hrs/Week:	5	L	-	T	-	P	5	Credits:	3

COURSE OBJECTIVE

1. To equip the students to learn about convolution and correlation of discrete signals.
2. Can able to design filter circuits.
3. Can able to impart implementation of arithmetic operations.
4. To enable the students to get knowledge on analysis of DFT and FFT signals.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember and apply basic signal processing operations.	K1
CO2	Characterise the abilities towards MATLAB based implementation of various DSP systems.	K2
CO3	Apply the architecture of a DSP Processor.	K3
CO4	Detect a system for various applications of DSP.	K4

SYLLABUS

20ELP16	Practical V: Digital Signal Processing	Sem: III
Experiment No.	(Using TMS320C5XX/TMS320C54XX/TMS320C67XX/MATLAB) Topics (Any 10 Experiments)	
1	Arithmetic Operations.	
2	Convolution of Two Discrete Signals.	
3	Correlation of Two Discrete Signals	
4	Waveform Generation	
5	Frequency Sampling Method	
6	Impulse, Step, Exponential & Ramp Functions	
7	Solving Z-Transform	

8	Solving Differential Equations	
9	Design of FIR Filter	
10	Design of IIR Filter	
11	Voice Storing & Retrieval	
12	Quantization Noise	
13	Echo Cancellation	
14	Amplitude Modulation and FFT Response	
15	Frequency Analysis using DFT	

Teaching methods: < Practical Demonstration >

TEXT BOOK

1. Harold Kolimberis, "Digital Communication Systems with Satellite and Fiber Optics Applications", Pearson Education, Third Indian Reprint, 2004.

REFERENCE BOOK

1. John G. Proakis, "Digital Communications", McGraw-Hill Higher Education, fourth Edition, 2000.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/108/105/1081050/>
<https://nptel.ac.in/courses/117/102/117102061>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	M	S	S	S
CO3	S	M	M	S
CO4	S	M	S	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Ms. MAHITHA MOHAN Name & Signature of the Staff	 Dr. K. THANUAVEL Name & Signature	 Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science,
 Coimbatore-641 028

Course Code:	20ELP17	Course Title						Batch:	2020-2021 & Onwards
		Practical VI: VLSI Design						Semester:	III
Hrs/Week:	5	L	-	T	-	P	5	Credits:	3

COURSE OBJECTIVE

1. To equip the students to learn about combinational and sequential circuits.
2. Can able to design latches and flip flop circuits.
3. Can able to impart implementation of registers and counters.
4. To enable the students to get knowledge on UART and SPI module.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Describe the combinational and sequential logic circuits using Digital IC's/ LabVIEW/ VHDL.	K1
CO2	Discuss the working of various combinational logic circuits.	K2
CO3	Discover the working of various sequential logic circuits.	K3
CO4	Figure out the working of FIFO.	K4

SYLLABUS

20ELP17	PRACTICAL VI: VLSI Design	Sem:III
Experiment No.	(Using Digital ICs / VHDL / Lab VIEW) Topics (Any 10 Experiments)	
1	Solving of Boolean Equations.	
2	Half Adder and Full Adder.	
3	Half Subtractor and Full Subtractor	
4	Encoder and Decoder.	
5	Multiplexer.	
6	Latches and Flip-Flops.	
7	De-multiplexer.	
8	Parity Generator.	
9	Comparators.	

10	Shift Registers.	
11	Simple ALU Design	
12	Synchronous and Asynchronous Counter	
13	Clock Divider and Generator.	
14	FIFO Design.	
15	UART and SPI Module	

Teaching methods: < Practical Demonstration >

TEXT BOOK

1. *Muhammad Ali Mazidi, Janice GillispieMazidi and Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems Using Assembly and C" by PHI, 2nd Edition, 2006.*

REFERENCE BOOK

1. *Kenneth J. Ayala, "The 8051 Microcontroller", Delmar Cengage Learning, 3rd Edition, 2004.*

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/106/103/106103116/>
<https://nptel.ac.in/courses/106/103/106103016/>



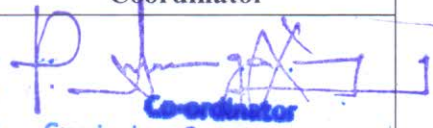
MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO	PO1	PO2	PO3	PO4
CO1		S	S	S	S
CO2		M	S	S	S
CO3		S	M	S	M
CO4		S	M	M	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Dr. R. PREMA Name & Signature of the Staff	 Dr. K. THANDAVEL Name & Signature	 Coordinator Curriculum Development Cell Hindusthan College of Arts & Science Coimbatore-641 028.

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Course Code:	20ELP18A	Course Title						Batch:	2020-2021 & Onwards
		Elective A:- Wireless Sensor Networks						Semester:	III
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVE

1. To equip the students to learn about fundamentals of wireless LAN.
2. Can able to get knowledge in wireless internet and sensor network.
3. Can able to impart exposure on wireless ad-hoc networks.
4. To enable the students to know more on recent advances in wireless network.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Reproduce the basic concepts of wireless sensor networks, internet and computing	K1
CO2	Extrapolate wireless sensor network with sensor nodes.	K2
CO3	Diminish the ad-hoc wireless network.	K3
CO4	Explore the significance of wireless sensor networks and recent advancements.	K4

SYLLABUS

20ELP18A	Elective A:- Wireless Sensor Networks	Sem: III
Unit No.	Topics	Hours
I	Wireless LANS, PANS AND MANS Introduction – Fundamentals of WLAN – Technical Issues – Network Architecture – IEEE 802.11– Physical Layer – MAC Layer Mechanism – CSMA/CA – Bluetooth – Specification – Transport Layer – Middleware Protocol Group – Bluetooth Profiles – WLL – Generic WLL Architecture– Technologies – Broadband Wireless Access – IEEE802.16– Differences Between IEEE 802.11 and 802.16 – Physical Layer – Data Link Layer.	13
II	Wireless Internet Address Mobility – Inefficiency of Transport Layer and Application Layer Protocol – Mobile IP – Simultaneous Binding – Route Optimization– Mobile IP Variations – Handoffs – IPv6 Advancements – IP for Wireless Domain – Security in Mobile IP – TCP in Wireless Domain – TCP Over Wireless – TCPs – Traditional – Snoop – Indirect – Mobile Transaction–Oriented – Impact of Mobility.	13

III	AD-HOC Wireless Network Introduction – Issues – Medium Access Scheme – Routing – Multicasting – Transport Layer Protocol – Pricing Scheme – QoS Provisioning – Self-Organization – Security – Addressing – Service Discovery – Energy Management – Deployment Consideration – Ad-Hoc Wireless Internet.	13
IV	Wireless Sensor Network Architecture - Applications of Sensor Network, Comparisons with MANET – Issues and Design Challenges – Layered and Clustered– Data Dissemination – Data Gathering MAC Protocols – Location Discovery – Quality of Sensor Network – Coverage and Exposure.	13
V	Recent Advances in Wireless Network UWB Radio Communication – Operation of UWB Systems – Comparisons with Other Technologies – Major Issues – Advantages and Disadvantages, Wi-Fi Systems– Service Provider Models, Issues, Interoperability of Wi-Fi and WWAN, Multimode 802.11 – IEEE 802.11a/b/g – Software Radio-based Multimode System, MeghadootArchitecture.	13

Teaching methods: < Lecturing, Lecture imposed with questions, PowerPoint Projection through LCD, Assignment, Discussion, Seminar, Buzzles and Quiz >

TEXT BOOKS

1. Siva Ram Murthy C and Manoj B.S, "Ad Hoc Wireless Networks – Architecture and Protocols", Pearson Education, 2nd Edition, 2012.
2. William Stallings, "Wireless Communication and Networks", Prentice Hall, second Edition, 2005.

REFERENCE BOOKS

1. Kaveh Pahlavan and Prashant Krishnamurthy, "Principle of Wireless Network– A unified approach", Prentice Hall, 2006.
2. Ian F. Akyildiz (Author), Mehmet Can Vuran, "Wireless Sensor Networks (Advanced Texts in Communications and Networking, Wiley Publications, 1st edition, 2011.
3. C.S. Raghavendra, Krishna M. Sivalingam, Taieb Znati, "Wireless Sensor Network", Springer Science & Business Media, 2005
4. Walteneagus Dargie, Christian Poellabauer "Fundamentals of Wireless Sensor Networks: Theory and Practice (Wireless Communications and Mobile Computing Book 24)" 1st Edition, 2011.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/106/105/106105160/>
<https://nptel.ac.in/courses/117/104/117104118/>

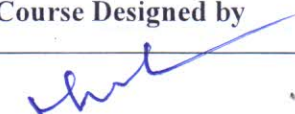


MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	M	M
CO4	S	S	M	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 M. M. KUMARESAN Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Course Code:	20ELP18B	Course Title						Batch:	2020-2021 & Onwards
		Elective B:- ARM Core Processor						Semester:	III
Hrs/Week:	5	L	5	T	-	P	-	Credits:	4

COURSE OBJECTIVE

1. To equip the students to learn about fundamentals of ARM processor.
2. Can able to understand the programming concepts of ARM.
3. To impart knowledge about ARM7 TDMI processor.
4. To enable the students to get knowledge on hardware configuration.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the features of embedded systems and architecture of ARM7.	K1
CO2	Explain the instruction set ARM7	K2
CO3	Diminish the operation of exceptions, interrupts and interrupt handling.	K3
CO4	Explore the interfacing of peripheral devices to LPC2378.	K4

SYLLABUS

20ELP18B	Elective B: ARM Core Processor	Sem: III
Unit No.	Topics	Hours
I	Introduction to ARM Embedded System RISC Design Philosophy –ARM Design Philosophy – Embedded System Hardware Memory – Peripherals – Embedded System Software Initialization (Boot) Code – Operating System –Applications.	13
II	ARM Processor Fundamentals ARM Core Data Flow Model – Registers – Current Program Status Register (CPSR) – Processor Modes – Bank Registers –State and Instruction Sets – Interrupts Masks – Condition Flags – Conditional Execution – Pipeline – Exceptions, Interrupts & Vector Table – Core Extension – ARM Processor Families.	13
III	Efficient C Programming C Compiler and Optimization – Basic C Data Types – C Looping Structure– Register Allocation – Function Calls – Pointer Aliasing – Structure Arrangement – Bit–fields – Unaligned Data and Endianness – Division – Floating Point – Inline Functions and Inline Assembly – Portability issues.	13

IV	ARM7TDMI MCU (Analog Devices LPC2378) Features – Functional Block Diagram – General Description – Pin Configuration & Function Descriptions – Overview of the AR7TDMI Core – Exceptions – ARM Registers Interrupt Latency – Memory Organization – Memory Access – Flash/EE Memory – SRAM –Memory Mapped Register – Software Programs.	13
V	Hardware Configuration ADC – DAC – Oscillator and PLL – PWM – General Purpose I/O– Serial Port MUX – UART Serial Interface – I ² C – Timer Life Time– General Purpose Timer – Wake Up Timer – Watch Dog Timer – General Purpose Timer 4 – Real Time Applications.	13

Teaching methods: < Lecturing, Lecture imposed with questions, PowerPoint Projection through LCD, Assignment, Discussion, Seminar, Buzzles and Quiz>

TEXT BOOKS

1. Andrew N.Sloss, Dominic Symes and Chris Wright “ARM System Development Guide”, Morgan Kaufmann Publishers, Reprinted, 2016.
2. Data Sheet Reference (Analog Devices LPC 2377/78).

REFERENCE BOOKS

1. Frank Vahid “Embedded System Design”, Tata McGraw Hill Publication Company Ltd, Third Edition, Reprint, 2014.
2. Joseph Yiu “The Definitive Guide to ARM® Cortex®-M3 and Cortex®-M4 Processors”, Newnes, 2013.
3. Jonathan W. Valvano, “ Embedded Systems: Introduction to Arm® Cortex Microcontrollers”, 5th edition, 2016.
4. Andrew Sloss, Dominic Symes and Chris Wright, “ARM System Developer's Guide: Designing and Optimizing System Software”, Elsevier Science, 2004.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/106/108/106108100/>
<https://nptel.ac.in/courses/117/104/117104072/>

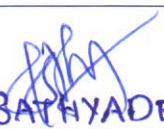
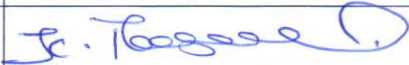
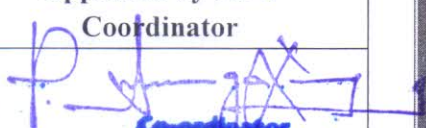
MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	M	M
CO4	S	S	M	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Mrs. S. SATHYADEEPA Name & Signature of the Staff	 Dr. K. THANDAVEL Name & Signature	 Coordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Course Code:	20ELP19	Course Title						Batch:	2020-2021 & Onwards
		Nanoelectronics and Nanosystems						Semester:	IV
Hrs/Week:	6	L	6	T	-	P	-	Credits:	6

COURSE OBJECTIVE

1. To equip the students to learn about development of Microelectronics.
2. Can able to understand more on quantum electronics.
3. Can able to impart implementation of tunneling devices and single electron transistor.
4. To enable the students to get knowledge on emerging nano systems.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the fundamentals of development of microelectronics	K1
CO2	Understand the facts on Quantum Electronics	K2
CO3	Determine the functions of tunneling devices and single electron transistor.	K3
CO4	Explain the importance of emerging Nano Systems	K4

SYLLABUS

20ELP19	Nanoelectronics and Nanosystems	Sem: IV
Unit No.	Topics	Hours
I	Silicon Technology Development of Microelectronics – Challenge Initiated by Nanoelectronics – Potentials of Silicon Technology – Microminiaturization: Methods and Limits – Mechanical Systems – Integrated Optoelectronics – From Microelectronics towards Bimolecular Electronics.	16
II	Quantum Electronics Electromagnetic Fields and Photons – Schrodinger Equation – Electrons in Potential Wells – Photons Interacting with Electron in Solids – Quantum Electronics: Quantum Electronic Devices – Short Channel MOS Transistor – Split Gate Transistor – Electron Wave Transistor – Electron Spin Transistor – Quantum Cellular Automata – Quantum Dot Array.	16

III	Tunneling Devices Tunneling Element: Tunnel Effect and Tunneling Elements – Tunneling Diode – Resonant Tunneling Diode – Technology of RTD – Digital Circuit Design Based on RTD: Memory Circuits – Basic Logic Circuits – Dynamic Logic gates – Digital Circuit Design Based on RTBT.	16
IV	Single Electron Transistor (SET) Principle of SET – Coulomb Blockade – Performance of SET – SET Technology – SET Circuit Design: Wiring and Drivers – Logic and Memory Circuits – SET Adder – Comparison Between SET and FET Circuit Design.	15
V	Emerging Nano Systems Biological Networks – Biology Inspired Concepts – DNA Computer – Quantum Computer – Bioelectronics – Molecular Electronics – Fullerenes and Nano Tubes – Polymer Electronics – Self-Assembly – Optical Molecular Memories.	15

Teaching methods: < Lecturing, Lecture imposed with questions, PowerPoint Projection through LCD, Assignment, Discussion, Seminar, Buzzles and Quiz >

TEXT BOOKS

1. Goser. K, Glosekotter. P and Dienstuhl .J, "Nanoelectronics and Nanosystems", Springer International Edition, First Indian Reprint, 2005.
2. Ratner M.A and Ratner. D, "Nanotechnology; a Gentle Introduction to the Next Big Idea", Prentice Hall, 2002.

REFERENCE BOOKS

1. Poole .C.P and Owens F.J, "Introduction to Nanotechnology", John Wiley & Sons, 2003.
2. David Andrews; Thomas Nann; Robert H. Lipson, "Comprehensive Nanoscience and Nanotechnology", 2nd edition, 2019.
3. Murthy, Raj, Shankar, Rath /Murd, "Textbook Of Nanoscience And Nanotechnology", Universities press, 2012.
4. Shanmugam S, "Nanotechnology" (Volume 1), MJP Publishers; 1st edition , 2010.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/113/106/113106093/>
<https://nptel.ac.in/courses/117/108/117108047/>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	M	M
CO4	S	S	M	L

S-Strong, M- Medium, L – Low

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Dr. K. THANGAVEL Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Curricular Development Cell Name & Signature

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Curricular Development Cell
 Hindusthan College of Arts & Science,
 Coimbatore-641 028.

Course Code:	20ELP20A	Course Title						Batch:	2020-2021 & Onwards
		Elective A:- Real Time System Design						Semester:	IV
Hrs/Week:	6	L	6	T	-	P	-	Credits:	5

COURSE OBJECTIVE

1. To equip the students to learn about functional requirements of real time environment.
2. To understand more on hardware and debugging components used in real time systems.
3. To impart knowledge on high level design.
4. To enable the students to get knowledge on robotic media applications.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the principles of real time environment and IoT.	K1
CO2	Understand the working of various embedded system components and analyze the various real time systems using debugging components	K2
CO3	Apply the system life cycle requirements.	K3
CO4	Analyze various real time applications for emerging trends.	K4

SYLLABUS

20ELP20A	Real Time System Design	Sem: IV
Unit No.	Topics	Hours
I	Real Time Environment Functional Requirements – Temporal Requirements – Dependability Requirements – Classification of Real Time Systems – Real Time System Market – Examples: Controlling the Flow in a Pipe – Engine Control – Rolling Mill. IoT: Vision – Drivers – Technical Issues – RFID Technology.	16
II	Embedded System Components Hardware Components: I/O Interfaces –Processor I/O Interconnection –BUS Interconnection – High & Low Speed Serial Interconnection – Memory Subsystems – Firmware Components: Boot Code – Device Drivers – Operating System Services * – RTOS System Software Mechanisms – Software Application Components.	16
III	Debugging Components Single Step Debugging – Power on Self-Test Diagnostics – Application Level Debugging – Performance Tuning – High Availability and Reliability Design.	16




MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	S	M	M
CO4	S	S	M	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Mrs. S. SATHYADEEPA Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Co-ordinator Curriculum Development Cell Name & Signature Hindusthan College of Arts & Science Coimbatore-641 028.

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Course Code:	20ELP20B	Course Title						Batch:	2020-2021 & Onwards
		Elective B:- Virtual Instrumentation						Semester:	IV
Hrs/Week:	6	L	6	T	-	P	-	Credits:	5

COURSE OBJECTIVE

1. To study the basic concepts of data acquisition.
2. To understand the concept of signal processing.
3. To impart knowledge on features of Labview.
4. To get exposure on designing of VI systems for automation.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Define the concept of virtual instrumentation.	K1
CO2	Associate the Lab VIEW software for VI and Integrate VI tool sets.	K2
CO3	Adapt the working of data acquisition systems.	K3
CO4	Blueprint of various VI systems for automation will obtain.	K4

SYLLABUS

Code No	Subject	Semester No
20ELP20B	Virtual Instrumentation	IV
Units	Content	Hours
I	Graphical System Design: Introduction – Graphical System Design Model – Design Flow with GSD – Virtual Instrumentation – Virtual Instrument with Traditional Instrument – Hardware and Software in VI – VI for Test, Control and Design – VI in The Engineering Process – VI Beyond PC–GSD Using Lab VIEW – Graphical and Textual Programming.	16
II	Overview of Lab VIEW: Introduction – Advantage of Lab VIEW – Software Environment – Crating and Saving a VI – Front Panel and Block Diagram Toolbar – Palettes – Shortcut Menus – Front Panel Controls and Indicators – Block Diagram – Data Types – Data Flow Program – Lab VIEW Documentation Resources – Keyboard Shortcuts.	16

III	Repetition & Loops: Modular Programming in Lab VIEW – Introduction to Repetition and Loops – For and While Loop – Structures and Terminals– Shift Registers – Feedback Nodes – Control Timing – Communication Among Multiple Loops – Local and Global Variables. Arrays: Arrays in Lab VIEW – Creating One, Two and Multi-Dimensional Arrays – Initializing, Deleting, Inserting Replacing Elements, Rows, Columns and Pages Within Array – Clusters – Graphs and Charts.	16
IV	Instrument Control & DAQ: GPIB – VISA – Instrument Drivers – Serial Port Communication – Introduction to Data Acquisition – Transducers – Signals – Signal Conditioning – DAQ Hardware Configuration and Hardware – Analog Inputs and Outputs – DAQ Software Architecture – DAQ Assistant.	15
V	Applications of VI & IMAQ Vision Vision Basics – Image Processing and Analysis – Particle Analysis – Machine Vision – Motion Controller – Motor Amplifiers and Drives – Feedback Devices.	15

Teaching methods: < Practical Demonstaration >

TEXT BOOKS

1. Jovitha Jerome, "Virtual Instrumentation using LabVIEW", PHI, 2010.

REFERENCE BOOKS

1. Sanjay Gupta, Joseph John, "Virtual Instrumentation using LabVIEW", McGraw Hill, Second Edition, 2010.
2. LabVIEW: Basics I & II Manual, National Instruments, 2005.
3. Jeffrey Travis, Lisa K. Wells, "Labview for Everyone" (National Instruments Virtual Instrumentation Series), Prentice Hall; Subsequent edition, 2001.
4. Jovitha Jerome, "Virtual Instrumentation Using LabVIEW", Kindle Edition, PHI (30 January 2010)

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/106/106/106106138>
<https://nptel.ac.in/courses/109/103/109103101>


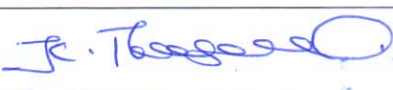

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	M
CO2	S	S	S	S
CO3	S	S	M	M
CO4	S	S	S	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Ms. MAHITHA MOHAN Name & Signature of the Staff	 Dr. K. THIANDAVEL Name & Signature	 Co-ordinator Name & Signature

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Curriculum Development Cell
 Hindusthan College of Arts & Science,
 Coimbatore-641 028.

Course Code:	20ELP21A	Course Title						Batch:	2020-2021 & Onwards
		Elective Practical: Internet of Things						Semester:	IV
Hrs/Week:	6	L	-	T	-	P	6	Credits:	3

COURSE OBJECTIVE

1. To equip the students to learn about Raspberry Pi.
2. To understand more on hardware and setting up of wireless access point.
3. To impart knowledge on interfacing concepts and automation.
4. To enable the students to get thorough knowledge and to become an enterprenuer.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the application areas of IOT	K1
CO2	Understand the revolution of Internet in Mobile Devices, Cloud & Sensor Networks	K2
CO3	Apply the building blocks of Internet of Things and its characteristics.	K3
CO4	Analyze the IoT products for various real time applications	K4

SYLLABUS

20ELP21A	Elective Practical: Internet of Things	Sem: IV
Experiment No.	Topics (Any 10 Experiments)	
1	Starting Raspbian OS, Familiarizing with Raspberry Pi Components and interface, Connecting to Ethernet, Monitor, USB.	
2	Displaying different LED patterns with Raspberry Pi.	
3	Displaying Time over 4-Digit 7-Segment Display using Raspberry Pi.	
4	Raspberry Pi Based Oscilloscope.	
5	Setting up Wireless Access Point using Raspberry Pi.	
6	ADC / DAC Interfacing with Raspberry Pi.	
7	Ultrasonic sensor interfacing with Raspberry Pi.	

8	Temperature Sensor Interfacing with Raspberry Pi.	
9	Fingerprint Sensor interfacing with Raspberry Pi.	
10	Raspberry Pi GPS Module Interfacing.	
11	IoT based Web Controlled Home Automation using Raspberry Pi.	
12	Visitor Monitoring with Raspberry Pi and Pi Camera.	
13	Interfacing Raspberry Pi with RFID.	
14	Building Google Assistant with Raspberry Pi.	
15	Installing Windows 10 IoT Core on Raspberry Pi	

Teaching methods: < Practical Demonstration >

TEXT BOOKS

1. *Vijay Madiseti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.*
2. *Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything 1st Edition, Apress.*

REFERENCE BOOKS

1. *Beginning Artificial Intelligence with the Raspberry Pi, Authors, Donald J. Norris, Barrington, New Hampshire, USA ISBN-13 (pbk): 978-1-4842-2742-8, Apress. (Unit-I to V)*
2. *Russell Stuart, "Artificial intelligence a modern approach", Pearson Education (US), Third edition, 2014*
3. *Derek Molloy, "Exploring Raspberry Pi: Interfacing to the Real World with Embedded Linux", Wiley; 1st Edition, 2016*
4. *Simon Monk, "Programming the Raspberry Pi, Getting Started with Python", McGraw-Hill Education TAB; 2nd edition October 5, 2015*

WEB RESOURCES

Web Link: <https://github.com/connectIOT/iottoolkit>
<https://www.arduino.cc/>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	M	S	M
CO4	S	S	M	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Mr. M. KUMARESAN Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Co-ordinator Name & Signature Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Course Code:	20ELP21B	Course Title						Batch:	2020-2021 & Onwards
		Elective Practical: Virtual Instrumentation						Semester:	IV
Hrs/Week:	6	L	-	T	-	P	6	Credits:	3

COURSE OBJECTIVE

1. To equip the students to learn about Labview.
2. To create simple VI programs.
3. To impart knowledge on discrete and convolution of signals..
4. To enable the students to get thorough knowledge on development of virtual instruments

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Define the software environment of Lab VIEW and use the programming structures and data types that exist in Lab VIEW.	K1
CO2	Estimate user interfaces with charts, graph and buttons.	K2
CO3	Assign the uses of data acquisition systems, analysis and display operations.	K3
CO4	Detect and save VIs for industrial applications.	K4

SYLLABUS

20ELP21B	Elective Practical: Virtual Instrumentation	Sem: IV
Experiment No.	Topics (Any 10 Experiments)	
1	Creating a simple VI to place a Digital Control	
2	Built a VI using while loop that displays random numbers in to three wave form charts. (Strip, scope & Sweep)	
3	VI to make a Degree C to Degree F Converter	
4	Application using Formula Node	
5	Converting VI in to SubVI	
6	Median Filter	

7	To count Modulus 32 and display the values in decimal, octal and binary.	
8	Discrete Cosine Transform	
9	Convolution of Two Signals	
10	Windowing Technique	
11	Instrumentation Amplifier to Acquire an ECG Signal	
12	Acquire, Analyze and Present an EEG using Virtual Instrumentation	
13	Development of Temperature Measurement	
14	Development of Virtual Instrument for Function Generator	
15	Development of Virtual Instrument for Audio Signal Spectrum Analyzer	

Teaching methods: < Practical Demonstaration>

TEXT BOOK

1. Jovitha Jerome, "Virtual Instrumentation using LabVIEW", PHI, 2010

REFERENCE BOOKS

1. Sanjay Gupta, Joseph John, "Virtual Instrumentation using LabVIEW", McGraw Hill, Second Edition, 2010.
2. LabVIEW: Basics I & II Manual, National Instruments, 2005.
3. Jeffrey Travis, Lisa K. Wells, "Labview for Everyone" (National Instruments Virtual Instrumentation Series), Prentice Hall; Subsequent edition , 2001.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/106/106/106106138/>
<https://nptel.ac.in/courses/109/103/109103101>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4
CO1	S	S	S	S
CO2	S	S	S	S
CO3	S	M	S	M
CO4	S	S	M	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal and External assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Ms. MAHITHA MOHAN Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Coordinator Name & Signature Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Course Code:	20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	Course Title						Batch:	2020-2021 & Onwards
		VAC: Electronic Test Instruments						Semester:	I / II / III
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVES

1. To impart the knowledge of different Electronic Test Instruments
2. To understand the working of various signal sources to the students.
3. To get strong knowledge on working of digital meters.
4. Can able to study the characteristics of oscilloscope.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember fundamentals of analog DC and AC type meters	K1
CO2	Understand the working of signal sources and digital meters	K2
CO3	Demonstrate the working of Oscilloscopes and Digital meters	K3
CO4	Examine to design new electronic test instruments for industrial needs	K4

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate

SYLLABUS

20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	VAC: Electronic Test Instruments	Sem: I / II / III
Unit No.	Topics	Hours
I	Analog Meters DC Meters: Voltmeter – Ammeter. AC Meters: Voltmeter– Ammeter. Analog Mutimeter.	6
II	Signal Sources Audio Frequency Generator – Function Generator – Wave Analyser – Spectrum Analyser.	5

III	Oscilloscopes General Purpose Oscilloscope – CRT – Single and Dual Trace – Storage Oscilloscope – Digital CRO.	5
IV	Digital Meters Digital Mutimeter – Digital Frequency Meter – Measurement of Time – Digital Tachometer – Digital pH Meter.	5
V	Recorders X-Y Recorder – Magnetic Recorder – Digital Data Recording – Digital Memory Waveform Recorder.	5

Teaching methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. Albert D. Herlfrick & William D. Cooper, "Modern electronic Instrumentation & Measurement Techniques" Prentice Hall of India, 2002. (Unit –I to III).
2. H S Kalsi, "Electronic Instrumentation" Tata McGraw-Hill, Second Edition, 2006. (Unit–IV & V)

REFERENCE BOOKS

1. Joseph, J.Carr, "Elements of Electronic Instrumentation & Measurements" III edition, Pearson Education, 2003.
2. Sawhney A.K, "A Course in Electrical and Electronic Measurements and Instrumentation" Dhanpat Rai & Co. 2015.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/108/105/108105153/>
https://swayam.gov.in/nd1_noc19_ee44/preview

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S
CO3	S	S	M	S	S	M	S
CO4	M	M	S	M	M	S	M
CO5	M	S	S	S	S	S	S

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Dr. K. THANMAVEL Name & Signature of the Staff	 Dr. K. THANMAVEL Name & Signature	 Co-ordinator Name & Signature Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Head of the Department
Department of Electronics
Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	Course Title						Batch:	2020-2021 & Onwards
		VAC: Verilog HDL						Semester:	I / II / III
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVES

1. To impart the concepts of digital circuit design using Verilog.
2. To equip the students to develop new digital systems.
3. To determine various operators used in verilog.
4. To diagnose the additional features used in verilog.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the functionality of digital systems	K1
CO2	Analyze and synthesize digital modules and circuits for a wide application range	K2
CO3	Interpret the special features of Verilog HDL	K3
CO4	Design and implement simple digital systems using Verilog	K4

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate

SYLLABUS

20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	VAC: Verilog HDL	Sem: I / II / III
Unit No.	Topics	Hours
I	Basics: Synthesis – Design Process – Logic Value System – Verilog Constructs To Gates: Continuous Assignment Statement – Procedural Assignment Statement.	6
II	Always – If – Case – Loop Statements – Functions – Tasks – Verilog Data Types – Nets – Register – Variables – Constants – Array Of Nets Or Registers.	5
III	Verilog Operators – Arithmetic – Bitwise – Reduction – Logical – Relational – Shift Conditional – Concatenation – Expressions And Operands – Operator Precedence.	5

IV	Additional Features of Verilog – Arrays of Primitives and Modules – Hierarchical Dereferencing – Parameters Substitution – Procedural Continuous – Intra Assignments – In Determinant Assignments and Race Condition – Wait Statements – Fork Join Statements.	5
V	Modeling Examples – Modeling Combinational Logic – Modeling sequential logic – modeling a memory – writing Boolean equations – Modeling a counter.	5

Teaching methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOK

1. J.Bhasker, “ Verilog HDL Synthesis, A Practical Primer” , BS Publication, 1st Indian Edition, 2008.

REFERENCE BOOKS

1. Micheal D. Ciletti, “Advanced Digital Design With The Verilog HDL”, PHI Publications, Indian reprint, 2014.

2. Morris Mano, “Digital Design with Verilog HDL”, Pearson Education, Fifth Edition, 2016.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/106/105/106105165/>
<https://nptel.ac.in/courses/106/105/106105083/>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S
CO3	S	S	M	S	S	M	S
CO4	S	M	S	M	M	S	M
CO5	M	S	S	S	M	S	S

S-Strong, M- Medium

Course Code:	20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	Course Title						Batch:	2020-2021 & Onwards
		VAC: Bioelectronics						Semester:	I / II / III
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVES

1. To impart the fundamentals of Bioelectronics
2. To get strong knowledge about electrical properties of Bio-Medical Instrumentation.
3. To enable the students to determine the features of bio nano machines.
4. To analyze about the energy conservation scheme.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Understand the principles of Bioelectronics	K1
CO2	Interpret the features of bio nano machines	K2
CO3	Apply energy conservation scheme in bioelectricity generation	K3
CO4	Analyze the cellular components of human body	K4

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate

SYLLABUS

20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	VAC: Bioelectronics	Sem: I / II / III
Unit No.	Topics	Hours
I	Overview of bioelectronics - the interactions between electronics and biomedical science -The fundamental properties of ions in the solution	6
II	The electrical properties of cellular components: lipid bilayer and membrane proteins - Natural nanoconductors: ion channels and pumps	5
III	Energy conversion scheme in the bioelectricity generation of the cell - Single channel recording: measurement and noise	5
IV	Patch clamp amplifier - Electronics of low noise current detection - Biomimetic versions of natural nanoconductors - Functional bionanomachines.	5

V	Medical applications of bioelectronics: ECG – EEG – EMG - Pre-clinical and clinical testing of bioelectronic technology	5
---	---	---

Teaching methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. Bertil Hille, "Ion Channels of Excitable Membrane", Sinauer Associates, Inc., 2001.
2. Chandran Karunakaran, Kalpana Bhargava, Robson Benjamin, "Biosensors and Bioelectronics" 1st Edition, 2009.

REFERENCE BOOKS

1. Wolfgang Hanke and W. R. Schlue, "Planar Lipid Bilayers: Methods and Applications", Academic Press, 2001
2. C.P. Wong, Kyoung-Sik Moon, "Nano Bio-Electronic, Photonic & MEMS Packaging, Springer, 2010.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/106/105/106105165/>
<https://nptel.ac.in/courses/106/105/106105083/>



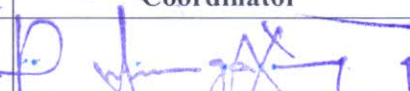
MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S
CO4	M	M	S	S	S	M	M
CO5	S	S	S	S	M	S	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Mrs. S. SATHYADEEPA Name & Signature of the Staff	 Dr. K. THANUAVEL Name & Signature	 Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028. Name & Signature

Head of the Department
 Department of Electronics
 Hindusthan College of Arts & Science
 Coimbatore-641 028

Course Code:	20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	Course Title						Batch:	2020-2021 & Onwards
		VAC: Materials Characterisation						Semester:	I / II / III
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVE

- 1.To recall the fundamentals of Materials Surface.
- 2.To understand about the morphology and thermal characterization techniques.
- 3.To classify the working principle of thermal analysis techniques.
- 4.Can able to explain about microscopy technique to observe microstructure.

COURSE OUTCOME (CO)

S. No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Students can recall the importance and classification of Characterization Techniques	K1
CO2	Student can describe the uses of vacuum systems in Material Characterization techniques	K2
CO3	Student can classify the working of Thermal Analysis techniques	K3
CO4	Student can analyze microscopy techniques to observe the microstructure	K4

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate

SYLLABUS

20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	VAC: Materials Characterization	Sem: I / II / III
Unit No.	Topics	Hours
I	Introduction to materials and methods – Fundamentals of Materials Characterization – Basic operation – Sample preparation and interpretation of data. Basic failure analysis of materials using different characterization equipment.	6
II	Thermal Analysis techniques: Principle - Working and application of DTA – TGA - TMA - DSC.	5
III	Spectroscopic Techniques for chemical analysis: UV-Visual (UV-VIS) – IR - FTIR - EDS – WDS - X-ray Fluorescopy (XRF) - Atomic absorption spectrometer (AAS).	5

IV	Diffraction method: Brags Law - X-ray diffraction methods - Determination of crystal structure - lattice parameter - crystallite size - merits and demerits.	5
V	Surface characterization: XPS (ESCA) – UPS - Auger Electron Spectroscopy - Electron Probe Micro Analysis (EPMA) - LEED.	5

Teaching methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. F. Weinberg Editor, *Tools & Techniques in Physical Metallurgy, Vol. I & II*, Marcel Dekker
2. John P. Sibilis, *A guide to Material Characterization & Chemical Analysis*, VCH Publishers, 1988.

REFERENCE BOOKS

1. J.M. Walls, Editor, *Methods of Surface Analysis : Techniques & Applications*, Cambridge University Press, 1990.
2. B.D. Cullity, *Elements of X-ray diffraction*, Addison-Wesley Publishing Company, INC.,

WEB RESOURCES

Web Link: <https://www.energy.gov/eere/education/eere-energy-101-video-series>




MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S
CO4	S	M	S	S	S	S	M
CO5	S	S	S	S	S	S	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal Assessment, suggested in the Regulations

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 MS. MAHITHA MOHAN Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Name & Signature Coordinator

Head of the Department
Department of Electronics
Hindusthan College of Arts & Science
Coimbatore-641 028

Curriculum Development Cell
Hindusthan College of Arts & Science
Coimbatore-641 028.

Course Code:	20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	Course Title						Batch:	2020-2021 & Onwards
		VAC: IoT and its Applications						Semester:	1 / II / III
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVES

1. To impart the concepts of Internet of Things (IoT)
2. To understand the Programming concept used for different devices for new applications.
3. Can able to analyze communication protocols.
4. To enable the students to examine an architecture and implement various applications.

COURSE OUTCOME (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Enumerate the concept of Internet of Things (IoT)	K1
CO2	Understand the communication protocols used for IoT applications.	K2
CO3	Correlate the most appropriate IoT Devices and Sensors based on Case Studies.	K3
CO4	Diagnose the implementation of various applications	K4

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate

SYLLABUS

20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	VAC: IoT and its Applications	Sem: 1 / II / III
Unit No.	Topics	Hours
I	The Internet of Things Today – Time for Convergence – Towards the IoT Universe – Internet of Things Vision – IoT Strategic Research and Innovation Directions – IoT Applications – Future Internet Technologies – Infrastructure – Networks and Communication.	6
II	M2M Value Chains – IoT Value Chains – An emerging industrial structure for IoT – M2M to IoT – An Architectural Overview – Building an architecture – Main design principles and needed capabilities.	5

III	State of the Art – Introduction State of the art – Architecture Reference Model – Introduction – Reference Model and architecture – IoT reference Model – IoT Reference Architecture – Functional View – Information View – Deployment and Operational View.	5
IV	Introduction IoT applications for industry: Future Factory Concepts –Brownfield IoT – Smart Objects – Smart Applications – IoT for Retailing Industry – Opinions on IoT Application – Home Management – E-Health.	5
V	Overview of Governance – Privacy and Security Issues – Contribution from FP7 Projects – Security – Privacy and Trust in IoT – Data-Platforms for Smart Cities.	5

Teaching methods: Power Point Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOK

1. Vijay Madiseti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014. (Unit-I to V)

REFERENCE BOOKS

1. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013.
2. Dhotre I.A, “IoT & its Applications”, Technical Publications, 2021.

WEB RESOURCES

Web Link: <https://github.com/connectIOT/iottoolkithttps://www.arduino.cc/>

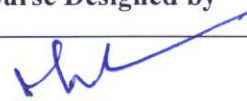
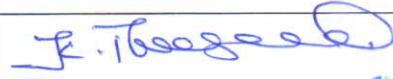

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S
CO4	S	M	S	S	S	S	M
CO5	S	S	S	S	S	S	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Mr. M. KUMARESAN Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Co-ordinator Name & Signature Curriculum Development Cell

Head of the Department
Department of Electronics
Hindusthan College of Arts & Science
Coimbatore-641 028

Hindusthan College of Arts & Science,
Coimbatore-641 028.

Course Code:	20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	Course Title						Batch:	2020-2021 & Onwards
		VAC: Electric Vehicle Design						Semester:	I / II / III
Hrs/Week:	2	L	2	1	-	P	-	Credits:	1

COURSE OBJECTIVE

1. To enhance the student's to remember the proper assembly and design of electric vehicle.
2. Helps to learn and describe different components of vehicle design.
3. To derive the dynamics of vehicle motion
4. Can able to examine hybrid electric vehicle.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember fundamentals of Vehicle mechanics and Laws of Motion	K1
CO2	Understand the Dynamics of Vehicle Motion	K2
CO3	Analyze the working of DC and AC machines	K3
CO4	Able to examine Hybrid Electric Vehicle for commercial needs	K4

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate

SYLLABUS

20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	VAC: Electric Vehicle Design	Sem: I / II / III
Unit No.	Topics	Hours
I	Electric vehicle system – Components of an Electric vehicle system – Historical perspective of EV system – EV Advantages – EV Market. Vehicle mechanics – Laws of Motion.	6
II	Vehicle Kinetics, – Dynamics of Vehicle Motion – Propulsion power – Velocity and Acceleration – Propulsion system design. Energy Source: Battery – Alternative Energy Sources.	5
III	Motor and engine ratings – EV and HEV motor requirements – DC machines – AC machines and their types – PM and SR machines – Switched Reluctance Machines.	5

IV	AC drives – Vector control of AC motors – SR motor drives – Electric Vehicle Drivetrain – EV transmission configurations – Ideal Gear box – EV motor sizing.	5
V	Hybrid Electric Vehicle – Types – Internal combustion engines – Design of an HEV – Hybrid Drivetrains – Rated Vehicle velocity – Initial Acceleration – Maximum velocity – Maximum Gradability.	5

Teaching methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOKS

1. Iqbal Husain, "Electric and Hybrid Vehicles Design Fundamentals", CRC Press, 2003. (Unit -I to V).

REFERENCE BOOKS

1. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, "Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2004.
2. James Larminie, John Lowry, "Electric Vehicle Technology Explained", Wiley, 2003.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/108/102/108102121/>
<https://nptel.ac.in/courses/108/103/108103009/>



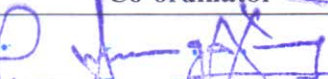
MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S
CO4	S	M	S	S	S	S	M
CO5	S	S	S	S	S	S	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Co-ordinator
 Dr. K. THANGAVEL Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Co-ordinator Curriculum Development Cell Hindusthan College of Arts & Science, Coimbatore-641 028.

Head of the Department

Department of Electronics
Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	Course Title						Batch:	2020-2021 & Onwards
		VAC: Ocean Electronics						Semester:	I / II / III
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVE

1. To impart the concepts of Ocean Electronics
2. To equip the students to explore the design knowledge on Ocean Electronics.
3. To get familiar with Oceanographic Instruments.
4. To enable the students to learn about under water wireless communication.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Recall the concept of Remote sensing	K1
CO2	Understand and synthesize the characteristics of sensorsystems	K2
CO3	Classify the features of underwater communication and wireless sensor networks	K3
CO4	Diagnose and implement Oceanographic Instruments	K4

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate

SYLLABUS

20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	VAC: Ocean Electronics	Sem: I / II / III
Unit No.	Topics	Hours
I	Introduction to Remote Sensing – Remote Sensing Vs SONAR – Applications of Remote Sensing – NADIR Radar System – Microwave Radiometer – Applications of Telemetry	6
II	Introduction to Sensors – Scanner Sensor Systems – Spatial Resolution, pixel size and scale – Marine Observation Satellite Sensors (MOS) – Measurement of Ocean Colour – Surface Currents	5

III	Underwater wireless Communication – Acoustic Communication – Optical Communication – LASER sensor architecture – MEMS approach – Under water mobile communication	5
IV	Oceanographic wireless sensor networks – Common WSN Architecture – General sensor node – Energy Harvesting – Wireless underwater sensor network – Acoustic sensor network	5
V	Oceanographic Instruments – Instruments and measured parameters – Oceanographic Instrumentation – Marine magnetometer – Submersible Incubation Device – Deep Ocean Tsunami Detection Buoy	5

Teaching methods: PowerPoint Projection through LCD, Assignment, Discussion and Activity.

TEXT BOOK

1. S.R. Vijayalakshmi & S. Muruganand, "Ocean Electronics", Overseas India Private Limited, 1st Edition. (Unit-I to V)

REFERENCE BOOKS

1. V.Chander & P.R.S. Pillai, "Ocean Electronics", Allied Publishers Private Limited, 1st Edition.
2. Erik Dahlman, "5G: The Next Generation Wireless Access Technology", First Edition, Academic Press, 2018.

WEB RESOURCES

Web Link: <https://nptel.ac.in/courses/114/105/114105002/>
<https://freevideolectures.com/subject/ocean-engineering/>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	M	S	S	S
CO3	S	S	M	S	S	S	S
CO4	S	M	S	S	S	S	M
CO5	S	S	S	S	S	S	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal assessment, suggested in the Regulations.

Course Designed by	Verified by HOD	Approved by CDC Coordinator
 Dr. R. PREMA Name & Signature of the Staff	 Dr. K. THANGAVEL Name & Signature	 Co-ordinator Name & Signature Curriculum Development Cell Hindusthan College of Arts & Science Coimbatore-641 028.

Head of the Department
Department of Electronics
Hindusthan College of Arts & Science
Coimbatore-641 028

Course Code:	20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	Course Title						Batch:	2020-2021 & Onwards
		VAC: Artificial Intelligence using Raspberry Pi						Semester:	I / II / III
Hrs/Week:	2	L	2	T	-	P	-	Credits:	1

COURSE OBJECTIVE

1. To recall the programming concepts of Artificial Intelligence
2. To get thorough knowledge in understanding of Raspberry Pi.
3. Can able to determine the features of Raspberry Pi
4. To design and implement various applications.

COURSE OUTCOMES (CO)

S.No	COURSE OUTCOME	BLOOMS LEVEL
CO1	Remember the concept of artificial Intelligence	K1
CO2	Describe neural networks used in Raspberry Pi	K2
CO3	Classify the features of Office database used in animal identification	K3
CO4	Design and examine various algorithms used in machine learning	K4

K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate

SYLLABUS

20ELPV01/ 20ELPV02/ 20ELPV03/ 20ELPV04	VAC: Artificial Intelligence using Raspberry Pi	Sem: I / II / III / IV
Unit No.	Topics	Hours
I	AI Historical Origins –Intelligence - Strong AI vs. Weak AI, Broad AI vs. Narrow AI – Reasoning -AI Categories - AI and Big Data.	6
II	Boolean Algebra -Expert Systems -Raspberry Pi Configuration - Installing Prolog on a Raspberry Pi -Introduction to Fuzzy Logic -Problem Solving - Machine Learning -Neural Networks -Evolutionary Computing.	5

III	Office Database - Animal Identification - tic-tac-toe - Cold or Flu Diagnosis - Expert System with Raspberry Pi GPIO Control : Installing PySWIP - Hardware Setup -Rpi.GPIO Setup - Expert System with LED Control.	5
IV	Machine Learning: -Demo: Color Selection -Algorithm -Roulette Wheel Algorithm -Demo: Autonomous Robot: Autonomous Algorithm -Test Run - Additional Learning.	5
V	Hopfield Network -Demo: Numerical Figure Recognition Demonstration - Autonomous Robot Car Using ANN -Python Control Script for the Obstacle-Avoiding -Robot Car -Light-Seeking Robot.	5

Teaching methods: Power Point Projection through LCD, Assignment, Discussion and Activity..

TEXT BOOKS

1. Beginning Artificial Intelligence with the Raspberry Pi, Authors, Donald J. Norris, Barrington, New Hampshire, USA ISBN-13 (pbk): 978-1-4842-2742-8, Apress. (Unit-I to V)

REFERENCE BOOKS

1. Francis X. Govers , “Artificial Intelligence for Robotics: Build intelligent”, First Edition, 2018.
2. Russell, “Artificial Intelligence: A Modern Approach”, Pearson Education, Third Edition, 2015.

WEB RESOURCES

Web Link: <https://www.raspberrypi.org/raspberrypi-store/>

MAPPING WITH PROGRAM OUTCOMES

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	S	S	S	S	S	S	S
CO2	S	S	S	M	M	S	S
CO3	S	S	M	S	S	M	S
CO4	M	M	S	S	S	S	M
CO5	S	S	S	S	S	S	M

S-Strong, M- Medium

ASSESSMENT PATTERN (if deviation from common pattern)

Follows common pattern of Internal assessment, suggested in the Regulations

Course Designed by	Verified by HOD	Approved by CDC Coordinator
Mrs. S. SATHYADEEPA Name & Signature of the Staff	Dr. K. THANUSAVEL Name & Signature	Name & Signature

Head of the Department
Department of Electronics
Hindusthan College of Arts & Science
Coimbatore-641 028

Coordinator
Curriculum Development Cell
Hindusthan College of Arts & Science,
Coimbatore-641 028.