Davangere University

Shivagangothri, Davangere- 577007

PROGRAM /COURSE STRUCTURE AND SYLLABUS

of

ELECTRONICS

as per the Choice Based Credit System (CBCS) designed in accordance with

Learning Outcomes-Based Curriculum Framework (LOCF) of National Education Policy (NEP) 2020

Bachelor of Science (B. Sc. Electronics)

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w.e.f.

Academic Year 2021-22 and onward

Chairman
Board of Studies
Department of Physics
Davangere University
Shivagangotri, Davangere-07

Registrar
Davangere University
Shivagangotri, Davangere

DEAN
Dr. RAMALINGAPPA
Professor and Dean,
Faculty of Science & Technology
Davangere University Shivagangotri
DAVANGERE - 577007

B. Sc. V and VI Semester

SEMESTER - V										
Category	**Course code**	**Title of the Paper**	**Marks**			**Teaching hours/week**			**Credit**	**Duration of exams (Hrs)**
			IA	**SEE**	**Total**	**L**	**T**	**P**		
DSC	**ELE-CT5.1**	Electronic Communication – II	40	60	100	4	-	-	4	2
	ELE-CP5.1	Electronic Communication – II (Practical)	25	25	50	-	-	4	2	3
	ELE-CT5.2	Embedded Controllers	40	60	100	4	-	-	4	2
	ELE-CP5.2	Embedded Controllers (Practical)	25	25	50	-	-	4	2	3
Total Marks					**300**	**Semester Credits**			**12**	

V Semester

Program Name	**B. Sc. Electronics**	**Semester**	**V**
Course Title	**Communication -II**		
Course Code:	**ELE-CT5.1**	No. of Credits	**4**
Contact hours	**60 Hours**	Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks	**40**	Summative Assessment Marks	**60**

Course Objectives:

- To understand the various microwave devices and their working
- To understand the Principle and working of different RADAR Systems.
- To understand principle and working of different digital modulation techniques.
- To understand the Principle and working of Cellular communication and different wireless techniques.

Course Outcomes:

- Know the various microwave devices, their working and applications.
- Understand the principle and working of different RADAR Systems.
- Familiar with ASK, FSK, PSK, BPSK, QPSK Digital modulation techniques.
- Understand the basic concept of cell phone hand set, working principle of cellular communication and wireless technologies.

Contents	**60Hrs**
Unit 1	15 Hrs

Microwave devices for Communication: RF/Microwaves, EM spectrum, Wavelength and frequency, rectangular waveguides, circular waveguides, microwave cavities, microwave hybrid circuits, directional couplers, circulators and isolators, GUNN diode, READ diode, IMPATT diode, BARITT diode, PIN diodes, Schottky barrier diodes, Multicavity Klystron, Magnetron, block diagram of Microwave communication and working, Applications.

Unit 2	15 Hrs

RADAR Communication Systems: RADAR principles, frequencies and powers used in RADAR, maximum Unambiguous range, detailed block diagram of pulsed RADAR system, RADAR range equation-derivation, factors influencing maximum range, effect of ground on RADAR antenna characteristics, doppler effect, expression for Doppler frequency. MTI RADAR-block diagram, working, CW RADAR-block diagram, working, advantages, applications and limitations, FM CW RADAR-block diagram, numerical examples wherever applicable

Unit 3	15 Hrs

Digital communication: Block diagram of digital transmission and reception, Bit Rate, Baud Rate Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Binary Phase Shift Keying (BPSK) and Quadrature Phase Shift Keying(QPSK). Advantage and

disadvantages of digital transmission, characteristics of data transmission circuits – Shannon limit for information capacity, bandwidth requirements, data transmission speed, noise, cross talk, echo suppressors, distortion and equalizer, MODEM– modes, classification.

Unit 4	15 Hrs
Cellular Communication and Wireless LANs: Concept of cellular mobile communication – cell and cell splitting, frequency bands used in cellular communication, absolute RF channel numbers (ARFCN), frequency reuse, roaming and hand off, authentication of the SIM card of the subscribers, IMEI number, concept of data encryption, architecture (block diagram) of cellular mobile communication network, Multiplexing, FDMA, CDMA, TDMA, OFDMA, GSM .Wireless LAN requirements- Bluetooth, Wi-Fi, MIMO, LTE and 5G technology. Comparative study of GSM and CDMA, simplified block diagram of cellular phone handset, Major components of local area network-Primary characteristics of Ethernet-mobile IP, OSI model.	

Reference Books	
1	D Roddy and J. Collen, "Electronics communications", 4th edition, PHI, 2008
2	B. P. Lathi and Zhi Ding, "Modern Digital and Analog communication Systems", Oxford University Press, 4th Edition, 2010
3	Bernard Skla 'Digital Communications: Fundamentals and Applications, Pearson Education, 2nd edition, 2009.
4	David Tse, Pramod Viswanath 'Fundamentals of Wireless Communication', Cambridge University Press,1st edition, 2005
5	Wayne Tomasi "Advanced Electronic Communication systems", - 6th edition, Low priced edition- Pearson education
6	Wayne Tomasi –"Electronic Communication systems, Fundamentals through Advanced", Vth edition.
7	Kennedy & Davis "Electronic Communication systems" , IV edition-TATA McGraw Hill.

Program Name	**B. Sc. Electronics**		**Semester**	**V**
Course Title	**Communication-II (Practical)**			
Course Code	**ELE-CP5.1**		No. of Credits	**2**
Formative Assessment Marks		**25**	Summative Assessment Marks	**25**

Part - A

1. Study of ASK generation and Detection.
2. Study of FSK generation and Detection.
3. Study of PSK generation and Detection.
4. Study of Time Division Multiplexing and Demultiplexing.
5. Study of Frequency Multiplier.
6. QPSK modulator and demodulator.
7. Determination of V-I Characteristics curve of a Gunn Diode.
8. Study of notch filter.
9. Class C tuned amplifier.
10. Study of Switched mode regulator using PWM.

Part- B

Simulation Experiments using MATLAB/SCILAB

1. Simulate NRZ, RZ, half-sinusoid and raised cosine pulses and generate eye diagram for binary polar signalling.
2. Pulse code modulation and demodulation system.
3. Computations of the Probability of bit error for coherent binary ASK, FSK and PSK for an AWGN Channel and compare them with their Performance curves.
4. DPSK Transmitter and receiver.
5. QPSK Transmitter and Receiver.

Program Name	**B. Sc. Electronics**		**Semester**	**V**
Course Title	**Embedded Controllers**			
Course Code:	**ELE-CT5.2**		No. of Credits	**4**
Contact hours	**60 Hours**		Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks		**40**	Summative Assessment Marks	**60**

Course Objectives:

- To know the importance of microcontrollers and its applications
- Understand the basics of Embedded Systems hardware and software concepts.
- Acquire knowledge about 8051 and PIC Microcontrollers and its peripherals.

Course Outcomes:

- Identify and understand function of different blocks of 8051 microcontrollers.
- Develop program for I/O port operations, Timers, Serial port and Interrupts using C.
- Gain the knowledge to interface LCD, Keyboard, ADC, DAC, DC motor, etc.
- Design and develop small scale embedded systems.

Contents	**60Hrs**
Unit 1	**15 Hrs**

Introduction: Embedded Systems, Examples of Embedded Systems, Design Parameters of Embedded Systems, Microcontrollers, Memory: Information Storage Device, Read Only Memory, Random Access Memory, Aligned and Unaligned Memory Accesses, The Microprocessor, Microprocessor Architecture Classification, Instruction Set Architecture, Memory Interface-Based Architecture Classification, Performance Comparison of Different Architectures, Software System and Development Tools, Software Sub-Systems, Software Development Tools, Debugging Tools and Techniques, Manual Methods, Software-Only Methods, Software-Hardware Debugging Tools.

Unit 2	**15 Hrs**

8051 Microcontroller: Architecture-Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing. Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples to use these instructions. 8051 Stack,

Stack and Subroutine instructions. Assembly language program examples on subroutine and involving loops.	
Unit 3	**15 Hrs**
8051 Microcontroller Hardware Programming in C: Data types and time delays, I/O Programming, Timer Programming, Serial Communication- Basics of Serial Data Communication, RS-232 standard, 9 pin RS232 signals, UASRT Serial port programming, Interrupt programming, Keyboard and LCD Interfacing, ADC, DAC interfacing, Using Flash and EEPROM memories for data storage, Stepper motor and DC motor interfacing.	
Unit 4	**15 Hrs**
PIC18 Microcontrollers: Overview of the PIC18 Family, Architecture and features of 18F458, Status register, Data memory and Special Function Registers, Data memory map, Access RAM, Indirect addressing and accessing tables in data memory, Program memory, Program memory map, Program Counter , Configuration registers, Stacks, Automatic Stack operations, Programmer access to the Stack, Fast Register Stack, Interrupts, Context saving with interrupts, Power supply and reset, Power supply, Power-up and Reset, Oscillator sources.	

Reference Books	
1.	Muhammad Tahir and KashifJaved, "ARM Microprocessor Systems: Cortex-M Architecture, Programming, and Interfacing," 1st Edition, CRC Press, 2017.
2.	Kenneth J. Ayala, "The 8051 Microcontroller", 3rd Edition, Thomson/Cengage Learning, 1997.
3.	Muhammad Ali Mazidi and Janice Gillespie and Rollin D, "The 8051 Microcontroller and Embedded Systems using assembly and C,"1st Edition, Pearson, 2006.
4.	Tim Wilmshurst, "Designing Embedded Systems with PIC Microcontrollers: Principles and applications", First Edition, Elsevier, 2007.
5.	Muhammad Ali Mazidi and Rolin D, Mckinlay, "PIC Microcontroller and Embedded Systems using assembly and C for PIC18," 1stEdition, Pearson, 2008.
6.	John Pitman, "Design with PIC Microcontrollers," 1st Edition, Prentice Hall, 1997.

Program Name	**B. Sc. Electronics**	**Semester**	**V**
Course Title	**Embedded Controllers (Practical)**		
Course Code	**ELE-CP5.2**	No. of Credits	**2**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

Part -A

Conduct the experiments by writing C programs using KeiluVision IDE for 8051

1. To read 10 data from port P0 and store in internal RAM.
2. Find the square of a numbers (1to10) using look-up table
3. To read data from port P0 and send the data to P1 if it is even else send to P2 repeatedly.
4. To read data from port P0 convert it to decimal and send to P1 and P2 repeatedly.
5. To toggle P0 bit for every 500ms continuously use TIMER 0 to generate time delay.
6. To read switch status connected to P1.0 if switch is on, turn on LED connected P2.0 on or if switch is off, turn off LED.
7. To read switch status connected to P1.0 if switch is on set P2.0 on or if switch is off set P2.0 off.
8. To stop/start toggling of LED connected to P0, when there is an external hardware interrupt.
9. To control traffic lights interface.
10. To transmit data "Hello Computer" to PC and receive data "Hi Microcontroller", from PC using USART Serial port.

Part – B

Using and Keil vision IDE for 8051

1. To rotate stepper motor clockwise 180^0.
2. To display numbers from 0 to F on seven segment display.
3. To display text "Electronics" on 16x2 LCD display.
4. To put a main function at ROM address 0x100 and data "HELLO" at ROM address 0x200.
5. To convert analog data to digital using ADC.
6. To write and execute ALP for addition, subtraction.
7. To write and execute ALP for multiplication, division.
8. To write and execute ALP for largest and smallest number of given numbers.
9. To write and execute ALP for ascending and descending order of given numbers.

Using MP Lab IDE for PIC

10. To monitor nit PC5, if it is High send 55H to PORT B; otherwise send AA to Port D
11. To convert Packed BCD ox29 ASCII and display The bytes on PORTB and PORTC
12. To send out the vale 44H serially one bit at a time via RC0, the LSB should go out first.
13. To convert analog signal to digital from external ADC and display the result on P2(any unused) port.
14. To control DC motor interfacing.

SEMESTER - VI

Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
			IA	SEE	Total	L	T	P		
DSC	**ELE-CT6.1**	Signals and Systems	40	60	100	4	-	-	4	2
	ELE-CP6.1	Signals and Systems (Practical)	25	25	50	-	-	4	2	3
	ELE-CT6.2	Internet of Things	40	60	100	4	-	-	4	2
	ELE-CP6.2	Minor Project	25	25	50	-	-	4	2	3
Total Marks					**300**	**Semester Credits**			**12**	

VI Semester

Program Name	**B. Sc. Electronics**		**Semester**	**VI**
Course Title	**Signals and Systems**			
Course Code:	**ELE-CT6.1**		No. of Credits	**4**
Contact hours	**60 Hours**		Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks		**40**	Summative Assessment Marks	**60**

Course Objectives:

- Gain the knowledge on Signals and Systems
- Understand the operations on Signals
- Know the frequency domain representation of signals
- Know the Laplace Transform and its properties

Course Outcomes:

- Distinguish between continuous-time and discrete-time signals and systems
- Do basic operations on signals
- Apply Laplace transform technique
- Find DTFS and IDTFS of the Signals

Contents	**60Hrs**
Unit 1	**15 Hrs**

Introduction to continuous-time and discrete-time signals: Understanding signals and systems, some real-world examples of signals and systems. Mathematical and graphical representation of signals, Classification of signals: 1- and 2-D, continuous and discrete, periodic and non-periodic, symmetries (even-odd) etc., related problems to enhance understanding of different signal types, elementary signals – unit impulse, unit step, exponential and sinusoidal signals. Introduction to continuous-time and discrete-time systems, examples of systems, interconnections of systems, Properties of systems: Linear, Non-linear, time variance-invariance, causal-non causal, memory-memoryless systems, feed-back in systems, stability, inverse systems.

Unit 2	**15 Hrs**

Operations on signals: amplitude scaling, shifting, folding, time scaling, addition of two signals etc., Time-domain representation of systems, Linear time-invariant systems, Convolution integral and convolution sum, impulse and step response of systems, differential equation representation of LTI systems, properties and stability of LTI systems, solving differential equations.

Unit 3	**15 Hrs**

Frequency domain representation of systems, magnitude and phase spectrum, Introduction to transforms, need for transforms. Laplace transforms, unilateral Laplace transforms, Properties, Inverse Laplace transforms, application of Laplace transforms for analysis of systems, solving differential equations, stability analysis of systems.

Unit 4	15 Hrs
Continuous-time Fourier series representation of periodic signals, convergence of Fourier series representation, properties of continuous-time Fourier series and problems Discrete-time Fourier Series properties of discrete-time Fourier series and problems IDFS.	

Reference Books	
1	Alan V Oppenheim, Alan s. Willsky and Hamid Nawab, "Signals and systems", Pearson edition Asia/PHI, 2nd Edition, 2002.
2	Simon Haykin and Barry Van Veen, "Signals & Systems," Wiley, 2nd Edition, 2021.
3	M J Roberts, "Signals and Systems Analysis Using Transform Methods and MATLAB,", TMG,
4	Vinay Ingle, and John G. Proakias, Digital Image Processing using MATLAB.

Program Name	**B. Sc. Electronics**		**Semester**	**VI**
Course Title	**Signals and Systems (Practical)**			
Course Code	**ELE-CP6.1**		No. of Credits	**2**
Formative Assessment Marks		**25**	Summative Assessment Marks	**25**

Write and execute following program using MATLAB/OCTAVE/SCILAB, etc.

1. Generate and plot unit sample, unit step, ramp, real sequences
2. Generate and plot sinusoidal, co sinusoidal and periodic sequences
3. Generate even & odd components of a sequence
4. Perform amplitude scaling, time scaling, folding and time-shifting operations on signals
5. Perform Up sampling and down sampling operation on a given sequence
6. Perform addition, subtraction and multiplication operation on signals
7. Find the linear convolution of two finite duration sequences.
8. Find the cross-correlation of two finite duration sequences
9. Evaluate & plot auto-correlation of a sequence
10. Compute the DTFS of a sequence and plot the magnitude and phase response
11. Compute the IDTFS of a sequence
12. Verify the sampling theorem

Program Name	**B. Sc. Electronics**		**Semester**	**VI**
Course Title	**Internet of Things**			
Course Code:	**ELE-CT6.2**		No. of Credits	**4**
Contact hours	**60 Hours**		Duration of SEA/Exam	**2 Hours**
Formative Assessment Marks		**40**	Summative Assessment Marks	**60**

Course Objectives:

- Understand the basic concepts and principles of the Internet of Things.
- Gain knowledge of different IoT technologies and protocols.
- Acquire practical skills in designing and implementing IoT applications.
- Develop an understanding of IoT security and privacy considerations.

Course Outcomes:

- Understand the basic concepts and principles of the Internet of Things.
- Gain knowledge of different IoT technologies and protocols.
- Acquire practical skills in designing and implementing IoT applications.
- Develop an understanding of IoT security and privacy considerations.

Contents	**60Hrs**
Unit 1	15 Hrs
Definition and evolution of the Internet of Things. IoT architecture and components. IoT communication protocols: MQTT, CoAP, HTTP. IoT application domains and use cases.	
Unit 2	15 Hrs
Overview of IoT devices: microcontrollers, sensors, actuators. Types and characteristics of sensors used in IoT applications. Interfacing sensors with microcontrollers. Data acquisition and sensor fusion techniques.	
Unit 3	15 Hrs
Wireless communication technologies for IoT: Wi-Fi, Bluetooth, Zigbee, LoRaWAN, etc. IoT network topologies: star, mesh, and hybrid networks. IoT data management and storage. IoT protocols for device-to-device and device-to-cloud communication.	
Unit 4	15 Hrs
IoT application development platforms and frameworks. Design and implementation of IoT applications. IoT security challenges and solutions. Privacy and ethical considerations in IoT.	

Reference Books	
1	Internet of Things: Principles and Paradigms by Rajkumar Buyya, Amir Vahid Dastjerdi, and Anton Y. Dongarra.
2	Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry by Maciej Kranz.
3	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things by David Hanes, Gonzalo Salgueiro, Patrick Grossetete and Robert Barton.
4	Internet of Things with Arduino Cookbook" by Marco Schwartz
5	Arduino Home Automation Projects" by Marco Schwartz and Oliver Manickum.

Program Name	**B. Sc. Electronics**	**Semester**	**VI**
Course Title	**Mini Project**		
Course Code	**ELE-CP6.2**	No. of Credits	**2**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

B. Sc. QUESTION PAPER PATTERN

B.Sc. _____ Semester Degree Examination; December, 2024

(CBCS Scheme; New Syllabus: 2023-24)

SUBJECT: _____ Paper: _____ Paper Code: _____

Time: 3 Hours **Max. Marks: 60**

Section-A

I. Answer Any Five Questions:5x2=10

1.
2.
3.
4.
5.
6.
7.
8.

Section-B

II. Answer Any Four Questions :4x5=20

9.
10.
11.
12.
13.
14.
15.

Section-C

III. Answer any Three Questions :3x10=30

16. a)
    b)
17. a)
    b)
18. a)
    b)
19. a)
    b)
20. a)
    b)

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