Model Curriculum Content for Semester V and VI Electronics

KUVEMPU UNIVERSITY

BOARD OF STUDIES (BOS) IN PHYSICS
(UNDER GRADUATE PROGRAMME)

APPROVED SYLLABUS

(To be effective from the academic year 2023-24)

For

V AND VI SEMESTER ELECTRONICS PAPERS

of

B.SC DEGREE PROGRAMME

[Framed in according with the National Education policy (NEP-2020)
& based on ***Model Electronics Syllabus*** prepared by electronics expert committee,
Karnataka State Higher Education Council, Bangalore]

Syllabus approved in the Board of Studies (BOS) meeting held on ***08-09-2023*** *at the*

Department **of Post-Graduate in Physics and Research, Jnana Sahyadri, Shankaraghatta**

Curriculum Structure-Electronics
(Core and Electives)

Semesters- V and VI SEM

SEM	COURSE CODE	SEC	Core Papers	Teaching Hours (per Week)	Credits
Sem-5	DSC-ELE51	----	**Communication -II**	4	4
	DSC-ELE51P	----	**Communication-II Practicals**	4	2
	DSC-ELE52	----	**Embedded Controllers**	4	4
	DSC-ELE52P	----	**Embedded Controllers Practicals**	4	2
Sem -6	DSC-ELE61	----	**Signals and Systems**	4	4
	DSC-ELE61P	----	**Signals and Systems Practicals**	4	2
	DSC-ELE62	----	**Artificial Intelligence**	4	4
	DSC-ELE62MP	----	**Mini Project**	4	2

Semester V

Program Name	**BSc in Electronics**	Semester	**Fifth Semester**
Course Title	**Communication -II**		
Course Code:	DSC-ELE51	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" , IVth edition-TATA McGraw Hill.

Program Name	**BSc in Electronics**	Semester	**Fifth Semester**
Course Title	**Communication-II Practicals**		
Course Code	DSC-ELE51P	No. of Credits	**2**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**
Note: Minimum of 8 Experiments from Part A and 4 Experiments from Part B			

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	**BSc in Electronics**		Semester	**Fifth Semester**
Course Title	**Embedded Controllers**			
Course Code:	DSC-ELE52		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/OProgramming, 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. Clock source switching, Parallel Ports, Parallel Slave Port, Watchdog Timer, Capture/Compare/PWM (CCP) Modules, MSSP Serial Port, Low-Voltage Detect, Nano-watt technology, Enhanced Peripherals.

Reference Books	
1.	Muhammad Tahir and Kashif Javed, "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	**BSc in Electronics**	Semester	**Fifth Semester**
Course Title	**Embedded Controllers Practicals**		
Course Code	DSC-ELE52P	No. of Credits	**2**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**
Note: Minimum of 8 Experiments from Part A and any 4 either using 8051 or PIC from Part B			

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 ifswitch 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 P2.0off.
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.

Using MP Lab IDE for PIC

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

Semester VI

Program Name	**BSc in Electronics**	Semester	**Sixth Semester**
Course Title	**Signals and Systems**		
Course Code:	DSC-ELE61	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-noncausal, 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,
	Vinay Ingle, and John G. Proakias, "Digital Image Processing using MATLAB,"

Program Name	**BSc in Electronics**	Semester	**Sixth Semester**
Course Title	**Signals and Systems Practicals**		
Course Code	DSC-ELE61P	No. of Credits	**2**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**
Note: Minimum of 10 programmes to be written and executed.			

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, cosinusoidal 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 Upsampling and downsampling 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

rogram Name	**BSc in Electronics**	Semester	**Sixth Semester**
Course Title	**Artificial Intelligence**		
Course Code:	DSC-ELE62	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, techniques, and applications of artificial intelligence.
- Gain knowledge of different problem-solving methodologies and intelligent agents.
- Be able to apply machine learning algorithms for data analysis and pattern recognition.
- Acquire an understanding of natural language processing and computer vision.
- Develop an awareness of ethical considerations and societal impacts of artificial intelligence.

Course Outcomes:

- Explain the fundamental concepts, techniques, and applications of artificial intelligence.
- Apply problem-solving and search algorithms to solve simple AI problems.
- Implement basic machine learning algorithms for classification and clustering tasks.
- Understand and apply natural language processing techniques for text analysis.
- Understand and apply computer vision techniques for image analysis.
- Recognize ethical considerations and societal impacts of artificial intelligence.

Contents	**60Hrs**
Unit 1	15 Hrs
Definition, history, and goals of artificial intelligence. Intelligent agents: types, properties, and architectures. Problem-solving and search algorithms: uninformed search, informed search (heuristic search), and game playing	
Unit 2	15 Hrs
Predicate logic and first-order logic. Inference mechanisms: resolution, forward chaining, and backward chaining. Knowledge representation techniques: propositional logic, semantic networks, frames, and ontologies.	
Unit 3	15 Hrs
Introduction to machine learning: supervised learning, unsupervised learning, and reinforcement learning. Classification algorithms: decision trees, naive Bayes, and support vector machines.Clustering algorithms: k-means, hierarchical clustering	
Unit 4	15 Hrs
Natural language processing: language modelling, part-of-speech tagging, syntactic parsing, and	

sentiment analysis. Computer vision: image representation, feature extraction, object recognition, and image classification.

Reference Books	
1	Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig.
2	Artificial Intelligence: Foundations of Computational Agents by David L. Poole and Alan K. Mackworth.
3	Machine Learning: A Probabilistic Perspective by Kevin P. Murphy.
4	Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit by Steven Bird, Ewan Klein, and Edward Loper.

Program Name	**BSc in Electronics**	Semester	**Sixth Semester**
Course Title	**Mini Project**		
Course Code	DSC-ELE6MP	No. of Credits	**2**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**