APPENDIX-1: Course Pattern and Scheme of Examination for B.Sc.(Basic) / B.Sc.(Hons.) as per NEP (2021-22 and Onwards)

Subject: Electronics

Sl. No.	Semester	Title of the Paper	Teaching Hours	Hours / week		Examination Pattern Max. & Min. Marks /Paper						Duration of Exam (hours)		Total Marks / paper	Credits	
						Theory			Practical							
				Theory	Practical	Max.	Min.	IA	Max.	Min.	IA	Theory	Practical		Theory	Practical
1	V	**DSCEL 501: Paper-5: Communication II**	60	4		60	21	40				2.5		100	4	
		DSCELP 501: Paper-5: Communication II Lab	60		4				25	13	25		4	50		2
2	V	**DSCEL 502: Paper 6 : Embedded Controllers**	60	4		60	21	40				2.5		100	4	
		DSCELP 502:Paper -6: Embedded Controllers Lab	60		4				25	13	25		4	50		2
3	VI	**DSCEL 601:Paper - 7 :Electronic Instrumentation and Biomedical Instruments**	60	4		60	21	40				2.5		100	4	
		DSCELP601:Paper - 7 : Instrumentation and IoT Lab	60		4				25	13	25		4	50		2
4	VI	**DSCEL 602: PAPER 8: Internet of Things and Robotics**	60	4		60	21	40				2.5		100	4	
		DSCELP 602: Paper - 8: Project Lab	60		4				25	13	25		4	50		2

Scheme of Internal Assessment Marks: Theory

Sl. No.	Particulars	IA Marks
1	Attendance	10
2	Internal Tests (Minimum of Two)	20
3	Assignments /Seminar / Case Study / Project work / Reports on - visits to industries/exhibitions/science centre / active participation in Electronics competitions, etc.	10
	TOTAL Theory IA Marks	40

Scheme of Internal Assessment Marks: Practical

Sl. No.	Particulars	IA Marks
1	Practical Test	05
2	Report on datasheet of electronic devices / Seminar on electronics experiments, etc.	10
3	Active participation in practical classes	10
	TOTAL Practical IA Marks	25

APPENDIX- 2: S y l l a b u s

Semester- V

DSCEL501: Paper-5: Communication II

(Credits: Theory – 04, Practical – 02) **Total Teaching: 60 Hrs**

Hours of Teaching: 4 Hrs / Week

Course Objectives: After the successful completion of the course, the student will be able to:

- To understand the various microwave devices and their working
- To understand principle and working of different digital modulation techniques.
- To understand the principle and working of Cellular Communication, different wireless techniques and mobile handset.
- To understand various OSI layers, Wi-Fi and IEEE standards.

Course Outcomes (COs): After the successful completion of the course, the student will be able to:

- Know the various microwave devices, their working and applications.
- Familiar with ASK, FSK, PSK, BPSK, QPSK digital modulation techniques.
- Understand the basic concept of cell phone handset, working principle of cellular communication and wireless technologies.
- Understand different Computer Networks, OSI layers, Ethernet and IEEE 802.11 a/b/g/n standards.

Unit 1 15 Hrs

Microwave Devices: 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, Multi cavity Klystron, Magnetron, block diagram of Microwave communication and working, Applications.

Unit 2 15 Hrs

Digital Communication: Block diagram of digital transmission and reception, Bit Rate and Baud. Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Binary Phase Shift Keying (BPSK) and Quadrature Phase Shift Keying (QPSK), 8PSK, 16PSK, 64PSK - definition and waveforms for each.

Quadrature amplitude modulation (QAM): 16 QAM and 64 QAM - definition and waveforms for each. 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 and classification.

Unit 3 15 Hrs

Cellular Communication: 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, WCDMA, TDMA, OFDMA, GSM- Qualitative analysis.
Bluetooth, Zigbee, Wi-Fi, MIMO, LTE, 5G technology and CV2X- qualitative analysis. Simplified block diagram of cellular phone handset. Wireless channel characteristics.

Unit 4 15 Hrs

Computer Networks: Introduction to Networks, Categories of Networks, Layered tasks, OSI Model, Layers in OSI model, TCP/IP Suite, Addressing, Switching, Telephone and cable networks for data transmission, Telephone networks, Dial up modem, DSL, Cable TV for data transmission. Wired LAN, Ethernet, IEEE standards, Standard Ethernet. Changes in the standards, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11a/b/g/n, Connecting LANs.

Suggested Learning Resources

Reference Books

1 D Roddy and J. Collen,"Electronicscommunications",4th edition, PHI,2008.

2 B. P. Lathi and ZhiDing, "Modern Digital and Analog Communication Systems", Oxford University Press,4thEdition, 2010

3 Bernard S k la 'Digital Communications: Fundamentals and Applications" Pearson Education, 2nd edition, 2009.

4 David T se,Pramod Viswanath 'Fundamentals of Wireless Communication', Cambridge University Press,1stedition,2005

5 Wayne Tomasi "Advanced Electronic Communication Systems", -6th edition, Low priced edition-Pearson Education

6 Wayne Tomasi–"Electronic Communication Systems, Fundamentals through Advanced", 5th edition.

7 Kennedy & Davis, "Electronic Communication Systems", IVth edition-TATA McGraw Hill.

DSCELP501: Paper 5:Communication II Lab

(Credits: Theory – 04, Practical – 02) Total Teaching: 60 Hrs

Hours of Teaching: 4 Hrs / Week

Part - A

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

***Any Five experiments from Part - A**

Part- B

Simulation Experiments.

1. Simulate NRZ, RZ, half-sinusoid and raised cosine pulses and generate eye diagram for 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.

***Any Three experiments from Part B**

DSCEL502: Paper 6 : Embedded Controllers

(Credits: Theory – 04, Practical – 02) Total Teaching: 60 Hrs

Hours of Teaching: 4 Hrs / Week

Course Objectives:

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

Unit 1 10 Hrs

Introduction to Microprocessors and Microcontrollers: Microprocessor Architecture-Harvard and Van-Neumann Architecture, CISC and RISC processors and their architectures. Difference between microprocessor and microcontroller. Introduction to Embedded Systems, Examples of Embedded Systems, Design Parameters of Embedded Systems, Embedded Software Development Tools: Integrated Development Environment(IDE). Editor, Assemblers, Compilers, linker, loader, Instruction Set Simulator(ISS) Debugging Tools and Techniques, Emulators.

8051 Microcontroller: Architecture, Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.

Unit 2 14 Hrs

Instruction set and Interfacing of 8051: Addressing Modes, Instruction set. Simple Assembly language program examples to use the instructions of 8051. Stack and Subroutine instructions. Assembly language Illustrative programs. Timer/counter, serial communication, interrupts and interfacing of 8051.

Unit 3 16 Hrs

PIC18 Microcontrollers: Overview of the PIC microcontroller family, Architecture and features of 18F458, Memory organization, Data memory organization, EEPROM, flash memory, Special Function Registers, Program Counter, Configuration registers, Stack memory, Interrupts, I/O ports, Timers, USART, Capture/Compare/PWM (CCP) Modules, MSSP Serial Port, CAN module, ADC, Special features of the CPU, Oscillator sources. Clock source switching, Instruction set. Watchdog Timer.

Unit 4 20 Hrs

Hardware interfacing and Microcontroller Programming in C: Data types and time delays, Data Serialization in C, Introduction to Communication Protocols – RS 232, I2C, USB, USART, SPI, CAN, and IrDA.

Program ROM allocation, Data RAM allocation, I/O Programming, Timer programming, Automatic Stack operations, Programmer access to the Stack, serial port programming, interrupt programming, generation of PWM signal PWM Motor Control with CCP.

Interfacing to 8051 and PIC: Switch, LED, seven segment LED, Keyboard, LCD, External ADC, DAC interfacing, Stepper motor, DC motor interfacing, Real time clock (RTC) and serial ADC.

Erasing and Writing Flash & EEPROM Memories For Data Storage. Sensor Interfacing and Signal Conditioning Standard.

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.

DSCELP502: Paper -6 : Embedded Controllers Lab

(Credits: Theory – 04, Practical – 02) Total Teaching: 60 Hrs

Hours of Teaching: 4 Hrs / Week

Part -A : Assembly language programming with 8051Microcontroller
(Experiments to be conducted using 8051-kit and simulator)

1. Addition and Subtraction of 8-bit and 16 bit numbers considering carry.
2. To verify the given numbers is prime or not.
3. Finding Largest and Smallest among n numbers.
4. To generate square of a number (1 to 10) using look-up table.

Part – B: Interfacing with 8051 and PIC18F458 Microcontroller
(Programs to be written using C)

1. Interfacing of switch/s and LED/s. a) To read switch status if switch is on, turn on LED or if switch is off, turn off LED. b) To blink the LED with different delay.
2. To interface seven segment LED display and program to implement countdown/up decimal digit 9-0
3. LCD (2X16) interfacing.
4. Interfacing of stepper motor and rotating stepper motor by N steps clockwise / anticlockwise with speed control.
5. Generate square, saw tooth, triangular and staircase waveform using DAC interface.
6. Display of 4- digit decimal number using the multiplexed 7-segment display interface.
7. Analog to digital conversion using internal ADC and display the result on LCD (using Internal ADC in PIC18F458).
8. Interfacing of serial ADC (MCP320x).
9. Speed control of DC motor using PWM (pulse delay to be implemented using timers).
10. To stop/start toggling of LED, when there is an external interrupt.
11. Interfacing of matrix keyboard (4X4).
12. Serial communication between microcontroller and PC.
13. Interfacing of Real Time Clock (DS1307).
14. Interfacing of I^2C based EEPROM/RAM/Flash.

*** All programs from PART-A and any SIX from PART-B**