KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION

ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ

ಸ್ವಾತಂತ್ರ್ಯದ ಅಮೃತ ಮಹೋತ್ಸವ

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NAAC Accredited
'A' Grade 2014

website: kud.ac.in

No. KU/Aca(S&T)/JS/MGJ(Gen)/2023-24/59 Date: 04/09/2023

ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2023–24ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಪದವಿಗಳಿಗೆ 5 ಮತ್ತು 6ನೇ ಸೆಮೆಸ್ಟರ್ NEP-2020 ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

ಉಲ್ಲೇಖ: 1. ಸರ್ಕಾರದ ಅಧೀನ ಕಾರ್ಯದರ್ಶಿಗಳು(ವಿಶ್ವವಿದ್ಯಾಲಯ 1) ಉನ್ನತ ಶಿಕ್ಷಣ ಇಲಾಖೆ ಇವರ ಆದೇಶ ಸಂಖ್ಯೆ: ಇಡಿ 104 ಯುಎನ್ಇ 2023, ದಿ: 20.07.2023.
2. ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ: 2 ರಿಂದ 7, ದಿ: 31.08.2023.
3. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ: 04/09/2023

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳನ್ವಯ ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶದ ಮೇರೆಗೆ, 2023–24ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ, ಎಲ್ಲ B.A./ BPA (Music) /BVA / BTTM / BSW/ B.Sc./B.Sc. Pulp & Paper Science/ B.Sc. (H.M)/ BCA/ B.A.S.L.P./ B.Com/ B.Com (CS) / BBA & BA ILRD ಸ್ನಾತಕ ಪದವಿಗಳ 5 ಮತ್ತು 6ನೇ ಸೆಮೆಸ್ಟರ್‌ಗಳಿಗೆ NEP-2020ರ ಮುಂದುವರೆದ ಭಾಗವಾಗಿ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದಿತ ಕೋರ್ಸಿನ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಭಿತ್ತರಿಸಲಾಗಿದೆ. ಸದರ ಪಠ್ಯಕ್ರಮಗಳನ್ನು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲದಿಂದ ಡೌನಲೋಡ ಮಾಡಿಕೊಳ್ಳಲು ಸೂಚಿಸುತ್ತ ವಿದ್ಯಾರ್ಥಿಗಳ ಹಾಗೂ ಸಂಬಂಧಿಸಿದ ಎಲ್ಲ ಬೋಧಕರ ಗಮನಕ್ಕೆ ತಂದು ಅದರಂತೆ ಕಾರ್ಯಪ್ರವೃತ್ತರಾಗಲು ಕವಿವಿ ಅಧೀನದ/ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ ಸೂಚಿಸಲಾಗಿದೆ.

ಅಡಕ: ಮೇಲಿನಂತೆ

04/9/23
ಕುಲಸಚಿವರು.

ಗೆ,
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ. (ಕ.ವಿ.ವಿ. ಅಂರ್ತಜಾಲ ಹಾಗೂ ಮಿಂಚಂಚೆ ಮೂಲಕ ಬಿತ್ತರಿಸಲಾಗುವುದು)

ಪ್ರತಿ:
1. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಕುಲಸಚಿವರ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ) ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ಅಧೀಕ್ಷಕರು, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆ / ಗೌಪ್ಯ / ಜಿ.ಎ.ಡಿ. / ವಿದ್ಯಾಂಡಳ (ಪಿ.ಜಿ.ಪಿಎಚ್.ಡಿ) ವಿಭಾಗ, ಸಂಬಂಧಿಸಿದ ಕೋರ್ಸುಗಳ ವಿಭಾಗಗಳು ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
5. ನಿರ್ದೇಶಕರು, ಕಾಲೇಜು ಅಭಿವೃದ್ಧಿ / ವಿದ್ಯಾರ್ಥಿ ಕಲ್ಯಾಣ ವಿಭಾಗ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

KARNATAK UNIVERSITY, DHARWAD

B.Sc. in ELECTRONICS

Syllabus for V and VI Semester

Discipline Specific Core Course (DSCC)

SEMESTER-V

DSCC-09: Theory (Code: 035ELE11)

DSCC-10: Practical (Code: 035ELE12)

DSCC-11: Theory (Code: 035ELE13)

DSCC-12: Practical (Code: 035ELE14)

SEC-03: Practical (Code: 035ELE 061)

SEMESTER-VI

DSCC-13: Theory (Code: 036ELE11)

DSCC-14: Practical (Code: 036ELE12)

DSCC-15: Theory (Code: 036ELE13)

DSCC-16: Practical (Code: 036ELE14)

Internship/Mini Project-01(Code: 036ELE 091)

AS PER NEP-2020

With Effective from 2023-24

Karnatak University, Dharwad
B.Sc. in Electronics
Effective from 2023-24

Sem	Type of Course	Theory/ Practical	Course Code	Course Title	Instruction hour/week	Total hours /sem	Duration of Exam	Marks			Credits
								Formative	Summative	Total	
V	DSCC-09	Theory	**035 ELE 011**	Electronic Communication II	04hrs	56	02hrs	40	60	100	04
	DSCC-10	Practical	**035ELE 012**	Electronic Communication II Practicals	04hrs	56	03hrs	25	25	50	02
	DSCC-11	Theory	**035ELE 013**	Embedded Controllers	04hrs	56	02hrs	40	60	100	04
	DSCC-12	Practical	**035ELE 014**	Embedded Controllers Practicals	04 hrs	56	03hrs	25	25	50	02
	Other subject										04
	Other subject										04
	Other subject										04
	SEC-3	Practical	**035ELE061**	PCB design and Simulation	04hrs	56	03hrs	25	25	50	02
										Total	**26**
VI	DSCC-13	Theory	**036ELE011**	Signals and Systems	04hrs	56	02hrs	40	60	100	04
	DSCC-14	Practical	**036ELE012**	Signals and Systems Practicals	04hrs	56	03hrs	25	25	50	02
	DSCC-15	Theory	**036ELE013**	Internet of Things	04hrs	56	02hrs	40	60	100	04
	DSCC-16	Practical	**036ELE014**	Internet of Things Practicals	04hrs	56	03hrs	25	25	50	02
	Other subject										04
	Other subject										04
	Other subject										04
	Internship/ Mini Project		**036ELE091**	Minor Project in Electronics				50	0	50	02
										Total	**26**

B.Sc. Semester–V

Discipline Specific Course (DSC)-09

Course Title: Electronic Communication -II

Course Code: 035 ELE 11

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-09	**Theory**	**04**	**04**	**56hrs.**	**2hrs.**	**40**	**60**	**100**

Course Outcomes (COs):

At the end of the course students will be able to:

1. Know the various microwave devices, their working and applications.
2. Understand the principle and working of different RADAR Systems.
3. Know the various types of transmission lines.
4. To understand the working principle of optical fiber communication and to know the various types of fiber optic cables.
5. Understand the basic concept of cell phone hand set, working principle of cellular communication and wireless technologies.

Unit	Title: Electronic Communication II	56 hrs/ sem
Unit I	**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.	14 hrs
Unit II	**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. MTIRADAR-block diagram, working, CWRADAR-block diagram, working, advantages, applications and limitations, FMCWRADAR-block diagram, numerical examples wherever applicable.	14 hrs
Unit III	**Transmission Lines and Optical Fiber Communications :** **Transmission lines;** Introduction, different types of transmission lines (parallel and coaxial lines), current and voltage relation on RF transmission line, definition ESWR and reflection coefficient. **OFC ;**Introduction ,block diagram of optical fiber system, advantages,	14 hrs

	disadvantages and applications, fiber optic cable and its types(step index and graded index).Cable mode fiber (single mode and multimode),light propagation through fiber, critical angle, acceptance angle, expression for numerical aperture. Types of light sources and detectors, losses in optical fiber. Numerical problems wherever applicable.	
Unit IV	**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.	14 hrs

Reference Books	
1	D Roddy and J. Collen, "Electronics communications",4th edition,PHI,2008
2	Microwaves K C Gupta.
3	Fiber Optic communication Govind Agarwal.
4	Optical Fiber communication Gerd Keyser.
5	DavidTse,PramodViswanath'FundamentalsofWirelessCommunication',Cambridge UniversityPress,1st edition,2005
6	WayneTomasi"AdvancedElectronicCommunicationsystems",-6th edition, Low priced edition-Pearson education
7	WayneTomasi–"ElectronicCommunicationsystems,FundamentalsthroughAdvanced V Ed·
8	Kennedy & Davis "Electronic Communication Systems" IVth Edition-TATA Mc Graw Hill.
9	Radio Engineering G K Mitthal
10	Introduction to RADAR systems Merrill I Skolnik.

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment Test1	10
Internal Assessment Test2	10
Assignment/Small Project/Activities	10
Seminar	10
Total	**40 Marks**
Formative Assessment as per guidelines.	

B.Sc. Semester–V

Discipline Specific Course (DSC)-10

Course Title: Electronic Communication II Practicals

Course Code: 035 ELE 012

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-10	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**25**	**25**	**50**

Course Outcomes (COs): At the end of the course, students will be able to:

1. Understand how to find NA and acceptance angle.
2. Understand different kinds of losses.
3. Understand receiver characteristics.
4. Understand time division Multiplexing and De-multiplexing.
5. Understand Frequency Multiplier and Frequency selective circuits.
6. Understand pulse code modulation and demodulation.

Minimum of 8 experiments from the following to be conducted;

Expt. No	Title: Electronic Communication II Practicals	56 hrs
1	Numerical aperture and acceptance angle of OFC.	
2	Study of receiver characteristics of OFC.	
3	Bending losses in OFC.	
4	Study of Time Division Multiplexing and De-multiplexing	
5	Study of Frequency Multiplier.	
6	QPSK modulator and demodulator	
7	Class C tuned amplifier	
8	Determination of V-I Characteristics curve of a Gunn Diode	
9	Pulse code modulation and demodulation.	
10	Frequency selective circuits- Active Low pass/High pass filters.	
11	Study of Notch filters.	
12	Study of switched mode regulator using PWM.	
13	Wave shaping circuits: clipping/clamping circuits.	

General Instructions:

1. Minimum of eight experiments to be performed.
2. Practical Records/Journal of the candidate should be certified by the concerned teacher/HOD only after ascertaining successful completion of practical course/experiments by the candidate
3. Any new experiment may be added to the list with the prior approval from the BOS.

Scheme of Practical Examination (Distribution of Marks): 25 Marks for Semester end Examination

1. Basic formula, Units & Nature of graph, Circuit Diagram/Ray Diagram/Schematic diagram.	**05 Marks**
2. Tabular column with quantities and unit mentioned experimental skills.	**05 Marks**
3. Recording of observations, calculations and drawing graph, and accuracy of the result.	**10 Marks**
4. Viva-Voce.	**2 Marks**
5. Completed & Certified Journal.	**3 Marks**
Total	**25 Marks**

Note: The same shall be used for internal examination as well as for semester end examination from I Sem to VI Sem from the academic year 2023-24.

B.Sc. Semester–V

Discipline Specific Course (DSC)-11

Course Title: Embedded Controllers

Course Code: 035 ELE 013

Type of Course	Theory/ Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-11	**Theory**	**04**	**04**	**56hrs.**	**2hrs.**	**40**	**60**	**100**

Course Outcomes (COs): At the end of the course, students will be able to:

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

Unit	Title: Embedded Controllers	56 hrs/ Sem
Unit I	**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-Hard ware Debugging Tools.	14 hrs
Unit II	**8051 Microcontroller**: - Features, Architecture- general purpose and special purpose/function registers, Program Status Word (PSW) register, SP, PC, DPTR, Pin diagram 8051, I/O ports functions, Internal memory organization, external memory (ROM and RAM) interfacing. **8051 Programming:** 8051 addressing modes: Immediate addressing, Register addressing, Direct addressing, Indirect addressing. Instructions set of 8051: 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.	14hrs

Unit III	**8051 Microcontroller Hardware Programming in C:** Data types, declaring variables, 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, DAC interfacing, Stepper motor and DC motor interfacing.	14hrs
Unit IV	**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.	14 hrs

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",3rdEdition, 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.	TimWilmshurst,"DesigningEmbeddedSystemswithPICMicrocontrollers:Principlesandapplications",FirstEdition,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.

Formative Assessment for Theory	
Assessment Occasion/ type	**Marks**
Internal Assessment Test 1	10
Internal Assessment Test 2	10
Assignment/Small Project/Activities	10
Seminar	10
Total	**40 Marks**
Formative Assessment as per guidelines.	

B.Sc. Semester–V

Discipline Specific Course (DSC)-12

Course Title: Embedded Controllers Practicals

Course Code: 035 ELE 014

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-12	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**25**	**25**	**50**

Course Outcomes (COs): At the end of the course, students will be able to:

1. Develop assembly language programming skills.
2. Develop program for I/O port operations using C and execute them.
3. Develop program for Timers, Serial port and Interrupts using C and execute them.

Minimum of 8 experiments from the following to be conducted;

Expt. No,	Title: Embedded Controllers Practicals	56 hrs/ Sem
	Conduct the experiments by using µC 8051 kit / Keil µVision IDE for 8051.	
1	ALP for Addition, subtraction.	
2	ALP for multiplication and Division of 8-bit number	
3	ALP for Addition and subtraction of two 16-bit number and store the result.	
4	ALP to find 2's compliment of i) 8-bit and ii) 16-bit numbers.	
5	ALP to find largest/Smallest of N given numbers.	
6	ALP to arrange the numbers in ascending and descending order.	
7	ALP to count number of o's and 1's of an 8-bit data.	
	Conduct the experiments, by writing C programs on Keilµ Vision IDE, using 8051 kit / Proteus simulator.	
8	To read 10 data from port P0 and store in internal RAM.	
9	Find the square of a numbers (1to10) using look-up table	
10	To read data from port P0 and send the data to P1 if it is even else send to P2 repeatedly.	
11	To stop/start toggling of LED connected to P0, when there is an external hardware interrupt.	
12	To toggle P0 bit for every 500ms continuously use TIMER 0 to generate time delay.	
13	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.	
14	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.	
15	To transmit data "Hello Computer" to PC and receive data "Hi Microcontroller", from PC using USART Serial port.	

Formative Assessment for Practical	
Assessment	**Distribution of Marks**
Algorithm	02
Flow chart	03
Writing program	05
Debugging and execution of program	10
Viva-voce	02
Completed and certified journal	03
Total	**25 Marks**
Formative Assessment as per guidelines.	

Note: The same shall be used for internal examination and semester end Examination From I sem to VI sem from the Academic Year 2023-24.

B.Sc. Semester–V

Skill Enhancement Course: SEC-3

Course Title: PCB Design and Simulation

Course Code: 035ELE061

Type of Course	Theory /Practical	Credits	Instruction hour/week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
SEC-3	**Practical**	**02**	**04**	**56 hrs.**	**3hrs.**	**25**	**25**	**50**

Minimum 8 experiments to be conducted;

1. Introduction to circuit creation and simulation software TINA student edition/Multisim/LT spice or any other suitable software.
2. Simulation of rectifier circuits half wave, full wave bridge rectifier and observe the outputs using virtual oscilloscope.
3. Simulation of full wave bridge rectifier with LC and π section filters and observe the outputs using virtual oscilloscope.
4. Power supply design with regulators LM7805 and LM7812.
5. Designing of clipper circuits and observe the output waveform using virtual oscilloscope.
6. Designing of clamper circuits and observe the output waveform using virtual oscilloscope.
7. Astable and monostable multivibrator using BC 547. Observe the outputs using virtual oscilloscope.
8. Op-Amp inverting/non inverting amplifier simulation. Observe the outputs using virtual oscilloscope.
9. Op-Amp instrumentation amplifier design and simulation. Observe the outputs using virtual oscilloscope.
10. AM modulation and demodulation. Observe the outputs using virtual oscilloscope.
11. FM modulation and demodulation. Observe the outputs using virtual oscilloscope.
12. ASK and FSK modulation and demodulation. Observe the outputs using virtual oscilloscope.
13. Single side PCB Layout design using CAD tool.
14. Development of PCB in hardware Lab using printing, etching , drilling and coating.
15. Fabrication of single side PCB for full wave rectifier circuit and resistive load in the lab.

General Instructions:

1. Minimum of eight experiments to be performed.
2. Practical Records/Journal of the candidate should be certified by the concerned teacher/HOD only after ascertaining successful completion of practical course/experiments by the candidate.
3. Any new experiment may be added to the list with the prior approval from the BOS.

Formative Assessment for SEC Practical	
Assessment	**Distribution of Marks**
Algorithm / flow chart / circuit diagram	05
Writing program / arranging components on IDE	05
Debugging and execution of program / simulation and result	10
Viva-voce	02
Completed and certified journal	03
Total	**25 Marks**
Formative Assessment as per guidelines.	

Note: The same shall be used for internal examination and semester end Examination from I sem to VI sem from the academic year 2023-24.

UG Program: 2023-24

GENERAL PATTERN OF THEORY QUESTION COURSE FOR DSCC

(60 marks for Semester end Examination with 2 hrs. duration)

Part-A

1. Question number 01-06 carries 2 Marks each. Answer any 05 questions : 10 marks

Part-B

2. Question number 07- 11 carries 05 Marks each. Answer any 04 questions : 20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks
   (Minimum 1 question from each unit and 10 marks question may have
   Sub-questions for 8+2, or 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed

B.Sc. Semester–VI

Discipline Specific Course (DSCC)-13

Course Title: Signals and Systems

Course Code: 036 ELE 011

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-13	**Theory**	**04**	**04**	**56hrs.**	**2hrs.**	**40**	**60**	**100**

Course Outcomes (COs): At the end of the course students will be able

1. Gain the knowledge on Signals and Systems
2. Understand the operations on Signals
3. Know the frequency domain representation of signals
4. Know the Laplace Transform and its properties
5. Distinguish between continuous-time and discrete-time signals and systems
6. Do basic operations on signals
7. Apply Laplace transform technique
8. Find DTFS and IDTFS of the Signals

Unit	Title: Signals and Systems	56 hrs/ sem
Unit I	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: Continuous and discrete, periodic and non-periodic, even and odd, energy and power signals, related problems to enhance understanding of different signal types. Elementary signals – unit impulse, unit step, unit ramp, 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- Memory less systems, feed-back in systems, stability, inverse systems.	14 hrs
Unit II	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, properties of convolution , impulse and step response of systems, differential equation representation of LTI systems, properties of LTI systems.	14hrs

Unit III	Frequency domain representation of systems, magnitude and phase spectrum. Introduction to transforms, need for transforms. Laplace transforms, Laplace transform of elementary functions. Properties of Laplace transforms, Laplace transform of derivatives and integrals, Laplace transform of unit step, unit ramp and unit impulse functions. Inverse Laplace transforms, HPF method to find inverse L.T, convolution theorem and its application to find inverse L.T. Application of Laplace transforms for solving electrical circuits and differential equations for analysis of systems.	14hrs
Unit IV	Continuous-time Fourier series representation of periodic signals, convergence of Fourier series representation, Properties of continuous-time Fourier series-linearity, time shift, frequency shift, scaling, time differentiation, convolution and problems,. Discrete-time Fourier Series (DTFS), properties of discrete-time Fourier series- linearity, time shift, frequency shift, scaling, time differentiation, convolution and problems on DTFS and IDTFS.	14hrs

Reference Books	
1	Alan V Oppenheim, Alans. 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	MJ Roberts, "Signals and Systems Analysis Using Transform Methods and MATLAB", TMG
	Vinay Ingle, and John G. Proakias, "Digital Image Processing using MATLAB,"

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment Test1	10
Internal Assessment Test2	10
Assignment/Small Project/Activities	10
Seminar	10
Total	**40 Marks**
Formative Assessment as per guidelines.	

B.Sc. Semester–VI

Discipline Specific Course (DSC)-14

Course Title: Signals and Systems Practicals

Course Code: 036 ELE 012

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-14	**Practical**	**02**	**04**	**56 hrs.**	**3 hrs.**	**25**	**25**	**50**

Course Outcomes (COs): At the end of the course, students will be able to:

1. Learn features of MATLAB as a programming tool.
2. Use MATLAB as a simulation tool.
3. Learn graphic features of MATLAB.
4. Able to generate plots of test signals such as unit impulse, unit ramp, unit step etc.
5. Able to perform different operations on signals.

Expt. No.	Title: Signals and Systems Practicals	56 hours
	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 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	

Formative Assessment for Practical	
Assessment	**Distribution of Marks**
Algorithm / Flow chart	05
Writing program	05
Debugging and execution of program	10
Viva-voce	02
Completed and certified journal	03
Total	**25 Marks**
Formative Assessment as per guidelines.	

Note: The same shall be used for internal examination and semester end Examination from I sem to VI sem from the academic year 2023-24.

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B.Sc. Semester–VI

Discipline Specific Course (DSCC)-15

Course Title: Internet of Things

Course Code: 036 ELE 013

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-15	**Theory**	**04**	**04**	**56hrs.**	**2hrs.**	**40**	**60**	**100**

Course Outcomes (COs): At the end of the course students will be able to:

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

Unit	Title: Internet of Things	56.hrs/ sem
Unit I	Definition and evolution of the Internet of Things. IoT architecture and components. IoT communication protocols: MQTT, CoAP, HTTP. IoT application domains and use cases.	14hrs
Unit II	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.	14hrs
Unit III	Wireless communication technologies for IoT: Wi-Fi, Bluetooth, Zigbee, LoRa WAN, 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.	14hrs
Unit IV	IoT application development platforms and frameworks. Design and implementation of IoT applications. IoT security challenges and solutions. Privacy and ethical considerations in IoT.	14hrs

Reference Books	
1	Internet of Things: Principles and Paradigms by Rajkumar Buyya, Amir Vahid Dastjerdi, and AntonY.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 Cook book" by Marco Schwartz
5	Arduino Home Automation Projects" by Marco Schwartz and Oliver Manickum

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Assessment Test1	10
Internal Assessment Test2	10
Assignment/Small Project/Activities	10
Seminar	10
Total	**40 Marks**
Formative Assessment as per guidelines.	

B.Sc. Semester–VI

Discipline Specific Course (DSC)-16

Course Title: Internet of Things: Practicals

Course Code: 036 ELE 014

Type of Course	Theory /Practical	Credits	Instruction hour per week	Total No. of Lectures/ Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSCC-16	**Practical**	**02**	**04**	**56hrs.**	**3hrs.**	**25**	**25**	**50**

Course Outcomes (COs): At the end of the course, students will be able to:

1. Understand the basics of Internet of things.
2. Understand the exchange of information through internet and blue tooth.
3. Understand the interfacing of sensors with Arduino.
4. Understand the interfacing of LED/buzzer/relay with Arduino.

Minimum of 8 experiments from the following to be conducted

Expt. No.	Title: Internet of Things Practical	56 hours
1	IOT based LED control (on and off).	
2	Exchanging of information through internet.	
3	IOT based air pollution control system.	
4	Actuator controlling through cloud.	
5	Controlling two actuators using Arduino.	
6	Exchanging data over short distance og Bluetooth using Arduino.	
7	LED blinking using Arduino (Uno/Pro) /microcontroller.	
8	Ultrasonic sensor with Arduino/ gas detector using Arduino.	
9	Interfacing buzzer and a Switch with Arduino/microcontroller.	
10	Stepper motor interfacing with Arduino /micrseocontroller.	
11	Interfacing a relay with Arduino.	
12	Light sensor using Arduino.	
13	Arduino based digital thermometer.	
14	TDS sensor interfacing with Arduino.	
15	Fingerprint sensor interfacing with Arduino.	

Formative Assessment for Practical	
Assessment	**Distribution of Marks**
Algorithm / Flow chart	05
Writing program	05
Debugging and execution of program	10
Viva-voce	02
Completed and certified journal	03
Total	**25 Marks**
Formative Assessment as per guidelines.	

Note: The same shall be used for internal examination and semester end Examination from I sem to VI sem from the academic year 2023-24.

B.Sc. Semester–VI

Internship/Mini Project

Course Title: Internship/Mini Project in Electronics at UG level

Course Code: 036ELE091

Type of Course	Credits	Instruction hour per week	Total No. of Lectures/Hours /Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
Internship/ Project	**02**	**04**	**56hrs.**	**3hrs.**	**25**	**25**	**50**

Course Outcomes (COs): At the end of the course the students will be able to

CO1: The students learn the scientific methodology in carrying out internship/project work including planning and execution of the experiment.

CO2: The students acquire experiential learning by handling instruments/devices, etc., while setting up an experiment or by reading in-depth assigned subject for theoretical analysis.

CO3: The students learn the importance of team work, mutual participation and nurture their motivation either towards theoretical or experimental internship/project work.

CO4: Internship/project helps students to get research and industrial exposure and application of knowledge.

Internship:

A course requiring students to participate in a professional activity or work experience, or cooperative education activity with an entity external to the education institution, normally under the supervision of an expert of the given external entity. A key aspect of the internship is induction into actual work situations for 2 credits. Internships involve working with local industry, local governments (such as panchayats, municipalities)or private organizations, business organizations, artists, crafts persons, and similar entities to provide opportunities for students to actively engage in on-site experiential learning.

Note:

1. **One credit** internship is equal to 30 hrs on field experience.
2. Internship shall be Discipline Specific of 45-60 hours (2 credits) with duration 1-2 weeks.
3. Internship may be full-time/part-time (full-time during last 1-2 weeks before closure ofthe semester or weekly 4 hrs. in the academic session for 13-14 weeks).
4. College shall decide the suitable method for program wise but not subject wise.
5. Internship mentor/supervisor shall avail work allotment during 6^{th} semester for a maximum of 20hrs.
6. The student should submit the final internship report (45-60 hours of Internship) to the mentor for completion of the internship.
7. Method of Evaluation: Power Point Presentations, Submission of Report and Internship Completion Certificate.

Mini Project:

Electronics deals with various small and large circuits which deals with active and passive components, ICs, timers, sensors and embedded systems. Students can get good knowledge on electronics after doing some project work in the field.

The objective of the Project work is to provide a platform for the students to demonstrate their ability to apply their technical knowledge and skills gained from theory lectures and practical work throughout the course.

COs: After completing the project work students will be able to

1) Understand, plan and execute a mini project with team.
2) implement electronic hardware by learning PCB artwork design, soldering techniques, troubleshooting etc.
3) learn software development and hardware implementation.
4) Prepare a technical report on the mini project work.
5) Deliver a presentation based on the mini project work.

Mini project work is carried out in the following form:

This course will be conducted for students as an individual or in a group of three to four students under the guidance of a staff member in the college.

Course Guidelines:

1) Students should select a problem which addresses some basic home, office or other real life applications.
2) Students should understand testing of various component used in the selected circuits.
3) Soldering of components should be carried out by the students.
4) They should develop the necessary PCB for the circuit.
5) They should develop necessary software (optional) if required and implement it.
6) Final circuit should be submitted by them in working condition.
7) A written report of about 5 to 10 pages should be submitted individually.
8) A group of maximum four students can be permitted to work on one mini project.
9) Student should deliver presentation about the project and demonstrate its working individually.
10) The evaluation of the project carries a maximum of 50 marks. The experimental work and preparation of the report carries 40 Marks. The viva-voce examination carries a maximum of 10 marks and will be in the form of presentation by the student.

GENERAL PATTERN OF THEORY QUESTION COURSE FOR DSCC

(60 marks for semester end Examination with 2 hrs duration)

Part-A

1. Question number 1-06 carries 2 marks each. Answer any 05 questions : 10 marks

Part-B

2. Question number 07- 11 carries 05Marks each. Answer any 04 questions : 20 marks

Part-C

3. Question number 12-15 carries 10 Marks each. Answer any 03 questions : 30 marks
   (Minimum 1 question from each unit and 10 marks question may have sub questions for 7+3 or 6+4 or 5+5 if necessary)

Total: 60 Marks

Note: Proportionate weightage shall be given to each unit based on number of hours prescribed.