GULBARGA UNIVERSITY
"JANNA GANGA", GULBARGA - 585 106, KARNATAKA, INDIA.
08472-263202
FAX. 08472-263206
E-Mail: registrar@gug.ac.in
Website: www.gug.ac.in

ಸಂ.ಗುವಿಕ/ವಿಮವಿ/ಬಿ.ಓಎಸ್/2018–19/714 ದಿನಾಂಕ: 5-7-18

ಅಧಿಸೂಚನೆ

ವಿಷಯ: ಬಿ.ಎಸ್ಸಿ ಅನ್ವಯಿಕ ವಿದ್ಯುದ್ವಿಜ್ಞಾನ ಕೋರ್ಸಿಗಾಗಿ ಸಿಬಿಸಿಎಸ್ ಪದ್ಧತಿಯನ್ನು ಅಳವಡಿಸಿಕೊಂಡು ಅದಕ್ಕನುಗುಣವಾಗಿ ಪಠ್ಯಕ್ರಮವನ್ನು ಜಾರಿಗೊಳಿಸಿದ ಬಗ್ಗೆ.

ಉಲ್ಲೇಖ: 1) ಸ್ನಾತಕ ಅಧ್ಯಯನ ಮಂಡಳಿಯ ಸಭೆಯ ದಿನಾಂಕ: 11.06.2018.
2) ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ನಿಕಾಯದ ಸಭೆ ದಿನಾಂಕ: 14.06.2018.
3) ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಗೊತ್ತುವಳಿ ಸಂಖ್ಯೆ 11 ದಿನಾಂಕ.26.06.2018.

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ಉಲ್ಲೇಖ (3) ರಲ್ಲಿನ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್‌ನ ಸಭೆಯ ಗೊತ್ತುವಳಿ ಸಂಖ್ಯೆ 11 ನ್ನು ಅನುಷ್ಠಾನಗೊಳಿಸುತ್ತ; ಬಿ.ಎಸ್ಸಿ ಅನ್ವಯಿಕ ವಿದ್ಯುದ್ವಿಜ್ಞಾನ I ರಿಂದ VIನೇ ಸೆಮೆಸ್ಟರ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಧ್ಯಯನ ಮಂಡಳಿಯು ಪರಿಷ್ಕರಿಸಿ ಅನುಮೋದಿಸಿರುತ್ತದೆ. ದಿನಾಂಕ 14.06.2018. ರಂದು ಜರುಗಿದ ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ನಿಕಾಯದ ಸಭೆಯಲ್ಲಿ ಸದರಿ ಪಠ್ಯಕ್ರಮವನ್ನು 2018–19ನೇ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ ಜಾರಿಗೊಳಿಸಲು ಶಿಫಾರಸ್ಸು ಮಾಡಲಾಗಿದೆ.

ಅದರಂತೆ, 2018–19ನೇ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ ಬಿ.ಎಸ್ಸಿ ಅನ್ವಯಿಕ ವಿದ್ಯುದ್ವಿಜ್ಞಾನ ಸ್ನಾತಕ ಕೋರ್ಸಿನ I ರಿಂದ VIನೇ ಸೆಮೆಸ್ಟರ ಪಠ್ಯಕ್ರಮವನ್ನು ಪರಿಷ್ಕರಿಸಿ ಜಾರಿಗೊಳಿಸಲಾಗಿದೆ.

ಈ ಮಾಹಿತಿಯನ್ನು ಸಂಬಂಧಪಟ್ಟ ಶಿಕ್ಷಕರ ಹಾಗೂ ವಿದ್ಯಾರ್ಥಿಗಳ ಗಮನಕ್ಕೆ ತರಲು ಸೂಚಿಸಲಾಗಿದೆ. ಪಠ್ಯಕ್ರಮದ ವಿವರವನ್ನು ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್‌ಸೈಟ್ www.gug.ac.in ದಿಂದ ಪಡೆಯಬಹುದು.

ಕುಲಸಚಿವರು
ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ

ಗೆ,

1. ಮುಖ್ಯಸ್ಥರು, ಅನ್ವಯಿಕ ವಿದ್ಯುದ್ವಿಜ್ಞಾನ ಅಧ್ಯಯನ ವಿಭಾಗ, ಗು.ವಿ.ಕಲಬುರಗಿ.
2. ಎಲ್ಲಾ ಪದವಿ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಂಶುಪಾಲರಿಗೆ.

ಪ್ರತಿಗಳು:

1. ಡೀನ್‌ರು, ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ನಿಕಾಯ, ಗು.ವಿ.ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.
2. ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ), ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ.
3. ನಿರ್ದೇಶಕರು, ಯೋಜನೆ, ಮೇಲ್ವಿಚಾರಣೆ ಹಾಗೂ ಮೌಲ್ಯಮಾಪನ ಮಂಡಳಿ, ಗು.ವಿ.ಕಲಬುರಗಿ.
4. ಗ್ರಂಥಪಾಲಕರು, ಗು.ವಿ.ಕಲಬುರಗಿ ರವರ ಮಾಹಿತಿಗಾಗಿ
5. ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ನಿಕಾಯದ ಎಲ್ಲಾ ವಿಭಾಗಗಳ ಮುಖ್ಯಸ್ಥರಿಗೆ
6. ಮುಖ್ಯಸ್ಥರು, ಗಣಕಕೇಂದ್ರ, ಗು.ವಿ.ಕಲಬುರಗಿ ಇವರಿಗೆ ಸದರಿ ಪಠ್ಯಕ್ರಮವನ್ನು ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್ ಸೈಟ್ ನಲ್ಲಿ ಪ್ರಕಟಿಸಲು ತಿಳಿಸಲಾಗಿದೆ.
7. ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿ / ಕುಲಸಚಿವರ ಆಪ್ತ ಸಹಾಯಕರ ಮಾಹಿತಿಗಾಗಿ.

GULBARGA UNIVERSITY, KALABURAGI

Distribution of Courses/Papers in Under Graduate Program I to VI Semester as per Choice Based Credit System (CBCS) proposed for B.Sc Courses

Semester	Course Code	Course Type	Course Title	Credits	Teaching per week L:T:P	Total Credits
I	Semester					
	11	AECC-1a				6
	12	AECC-1b				
	13	AECC-1c				
	14	DSC 1A	Network Analysis and Analog Electronics	6	4:0:2	
	15	DSC 2A				
	16	DSC 3A				
II	21	AECC-2a				6
	22	AECC-2b				
	23	AECC-2c				
	24	DSC 1B	Linear and Digital Integrated Circuits	6	4:0:2	
	25	DSC 2B				
	26	DSC 3B				
III	31	AECC-3a				6
	32	AECC-3b				
	33	DSC 1C	Communication Electronics	6	4:0:2	
	34	DSC 2C				
	35	DSC 3C				
IV	41	AECC-4a				6
	42	AECC-4b				
	43	DSC 1D	Microprocessor and Microcontroller	6	4:0:2	
	44	DSC 2D				
	45	DSC 3D				
V	51	SEC-1	Electrical Circuits and Network Skills	2	1:0:1	10
	52	SEC-2	Analog, Digital and Electronic Communication Skills	2	1:0:1	
	53	DSE 1	Electronic Instrumentation	6	4:0:2	
	54	DSE 2				
	55	DSE 3				
VI	61	SEC-3	Consumer Electronics and Embedded Systems Skills	2	1:0:1	10
	62	SEC-4	Electronic Project	2	0:0:2	
	63	DSE 4	Photonic Devices and Power Electronics	6	4:0:2	
	64	DSE 5				
	65	DSE 6				
Total credits for the course						44

Note: Course = paper: AECC: Ability Enhancement Course, MIL: Media and Information Literacy.
DSC: Discipline Specific Core Course,
SEC: Skill Enhancement Course,
DSE: Discipline Specific Elective,
L=Lecture, T=Tutorial, P=Practical, Additional 02 credits shall be given for the successfully completion of two years of NSS (144+2=146), AECC-1c and AECC-2c papers shall be approved by the BOS of environmental science and political science, Tutorial/batch = 20 students, practical/batch 10 students, AECC-a and AECC-b papers cover communicative skill.

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Semester-I

DSC 1A: Network Analysis and Analog Electronics
Theory: 60 Lectures (Credits: 04)

Preamble: This paper helps the students to understand the principles and working of various analog passive and active devices which are the building blocks of any Electronic Systems.

UNIT-I: Circuit Analysis: Concept of Voltage and Current Sources. Kirchhoff's Current Law, Kirchhoff's Voltage Law. Mesh Analysis. Node Analysis. Voltage divider and Current divider theorems. Star and Delta networks, Star-Delta Conversion. Principal of Duality. Superposition Theorem. Thevenin's Theorem. Norton's Theorem. Reciprocity Theorem. Maximum Power Transfer Theorem. Two Port Networks: h, y and z parameters and their conversion. **(15 Lectures)**

UNIT-II: Junction Diode and its applications: PN junction diode (Ideal and practical)-constructions, Formation of Depletion Layer, Diode Equation and I-V characteristics. Idea of static and dynamic resistance, dc load line analysis, Quiescent (Q) point. Zener diode, Reverse saturation current, Zener and avalanche breakdown. Qualitative idea of Schottky diode. Rectifiers- Half wave rectifier, Full wave rectifiers (center tapped and bridge), circuit diagrams, working and waveforms, ripple factor and efficiency. Filter-Shunt capacitor filter, its role in power supply, output waveform, and working. Regulation- Line and load regulation, Zener diode as voltage regulator, and explanation for load and line regulation. **(15 Lectures)**

UNIT-III: Bipolar Junction Transistor: Review of the characteristics of transistor in CE and CB configurations, Regions of operation (active, cut off and saturation), Current gains α and β. Relations between α and β. dc load line and Q point. Amplifiers: Transistor biasing and Stabilization circuits- Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor S. Transistor as a two port network, h-parameter equivalent circuit.

(15 Lectures)

UNIT-IV: Small signal analysis of single stage CE amplifier. Input and Output impedance, Current and Voltage gains. Class A, B and C Amplifiers. Cascaded Amplifiers: Two stage RC Coupled Amplifier and Transformer coupled amplifier and their Frequency Response. Feedback in Amplifiers: Concept of feedback, negative and positive feedback, advantages of negative feedback (Qualitative only). **(15 Lectures)**

Reference Books:

1. Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004).
2. Electrical Circuits, M. Nahvi & J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005).
3. Electrical Circuits, K. A. Smith and R.E. Alley, 2014, Cambridge University Press.
4. Network, Lines and Fields, J. D. Ryder, Prentice Hall of India.

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5. Electronic Devices and Circuits, David A. Bell, 5th Edition 2015, Oxford University Press.
6. Electronic Circuits: Discrete and Integrated, D. L. Schilling and C. Belove, Tata McGraw Hill.
7. Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning.
8. Microelectronic circuits, A. S. Sedra, K. C. Smith, A. N. Chandorkar, 2014, 6th Edn., Oxford University Press.
9. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001).
10. J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill (1991).

DSC 1A Lab: Network Analysis and Analog Electronics
60 Lectures (Credits: 02)
At least 12 Experiments from the following besides:

1. To familiarize with basic electronic components (R, C, L, diodes, transistors), digital Multimeter, Function Generator and Oscilloscope.
2. Measurement of Amplitude, Time and Frequency using Oscilloscope.
3. Study of star and delta network & vice-versa.
4. Determination of y and z parameters of passive circuits.
5. Verification of Thevenin's theorem.
6. Verification of Norton's theorem.
7. Verification of Superposition Theorem.
8. Verification of Reciprocity Theorem.
9. Verification of the Maximum Power Transfer Theorem.
10. Measurement of h parameters of a two port network.
11. Study of the I-V Characteristics of p-n junction Diode.
12. Study of the I-V Characteristics of Zener diode.
13. Study of Half wave rectifier.
14. Study of Full wave rectifier.
15. Study the effect of C- filter.
16. Study of Zener regulator on the output of FWR.
17. Study of characteristics of CB configuration.
18. Study of characteristics of CE configuration.
19. Study of CE amplifier.
20. Study of feed back amplifier.

Reference Books:

1. Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005).
2. Networks, Lines and Fields, J.D.Ryder, Prentice Hall of India.
3. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001).
4. Allen Mottershead, Electronic Devices and Circuits, Goodyear Publishing Corporation.

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Semester-II

DSC 1B: Linear and Digital Integrated Circuits
Theory: 60 Lectures (Credits: 04)

Preamble: This paper presents the characteristics and applications of many linear and digital integrated circuits. The study of these components helps in developing many electronic systems.

UNIT-I: Operational Amplifiers (Black box approach): Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Open and closed loop configuration, Frequency Response. CMRR. Slew Rate and concept of Virtual Ground. Applications of Op-Amps: (1) Inverting and non-inverting amplifiers, (2) Summing and Difference Amplifier, (3) Differentiator, (4) Integrator, (5) Wein bridge oscillator, (6) Comparator and Zero-crossing detector, and (7) Active low pass and high pass Butterworth filter (1^{st} order only).
(15 Lectures)

UNIT-II: Number System and Codes: Decimal, Binary, Octal and Hexadecimal number systems, base conversions. Representation of signed and unsigned numbers, BCD code. Binary, octal and hexadecimal arithmetic; addition, subtraction by 2's complement method, multiplication. Logic Gates and Boolean algebra: Truth Tables and Logic symbols of OR, AND, NOT, NOR, NAND, XOR, XNOR, Universal Gates, Laws and theorems of Boolean algebra. Demorgan's theorems. Simplification of Boolean expressions.
(15 Lectures)

UNIT-III: Combinational Logic Analysis and Design: Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh map minimization up to 4 variables for SOP). Arithmetic Circuits: Binary Addition. Half and Full Adder. Half and Full Subtractor, 4- bit binary Adder/Subtractor. Data processing circuits: Multiplexers, De-multiplexers, Decoders, Encoders (Decimal to BCD Encoder.
(15 Lectures)

UNIT-IV: Clock and Timer (IC 555): Introduction, Block diagram of IC 555, Astable and Monostable multivibrator circuits. Sequential Circuits: SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. Master-slave JK Flip-Flop. **(15 Lectures)**

Reference Books:

1. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4^{th} edition, 2000, Prentice Hall.
2. Operational Amplifiers and Linear ICs, David A. Bell, 3^{rd} Edition, 2011, Oxford University Press.
3. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata Mc Graw.
4. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
5. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
6. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
7. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994).

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8. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994).

DSC 1B LAB: Linear and Digital Integrated Circuits
60 Lectures (Credits: 02)

At least 04 Experiments each from section A, B and C

Section-A: Op-Amp. Circuits (Hardware):

1. To design an inverting amplifier using Op-amp (741,351) for dc voltage of given gain.
2. To design an non inverting amplifier using Op-amp (741,351) for dc voltage of given gain.
3. To design inverting amplifier using Op-amp (741,351) & study its frequency response.
4. To design non-inverting amplifier using Op-amp (741,351) & study frequency response.
5. To add two dc voltages using Op-amp in inverting/non-inverting mode.
6. To subtract two dc voltages using Op-amp in inverting/non-inverting mode.
4. To design a Phase shift oscillator using Op-amp.
5. To investigate the use of an op-amp as an Integrator.
6. To investigate the use of an op-amp as a Differentiator.
7. To design a Wien bridge oscillator for given frequency using an op-amp.
   To design a circuit to simulate the solution of simultaneous equation and $1^{st}/2^{nd}$order differential equation.
8. Design a Butterworth Low Pass active Filter (1^{st} order) & study Frequency Response.
9. Design a Butterworth High Pass active Filter (1^{st} order) & study Frequency Response.
10. Design a digital to analog converter (DAC) using R-2R Ladder network.

Section-B: Digital Circuits (Hardware):

1. Construction of basic gates AND,OR using diodes and NOT using transistor
2. To design a combinational logic system for a specified Truth Table.
3. To convert Boolean expression into logic circuit & design it using logic gate ICs. and to minimize a given logic circuit.
4. Verification of Truth table of Basic gates using IC,s.
5. Verification of Truth table of universal gates, X-OR and X-NOR using IC's.
6. Verification of Demorgan's theorems
7. Half Adder and Full Adder.
8. To design a seven segment decoder using IC 74LS47.
9. To design a seven segment decoder using IC 74LS48.
10. To design an Astable Multivibrator of given specification using IC 555 Timer.
11. To design a Monostable Multivibrator of given specification using IC 555 Timer.
12. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.
13. To build JK Master-slave flip-flop using Flip-Flop ICs

Section-C: SPICE/MULTISIM simulations for electronic circuits and devices:

1. To verify the Thevenin and Norton Theorems.

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2. Design and analyze the series and parallel LCR circuits
3. Design the inverting and non-inverting amplifier using an Op-Amp of given gain.
4. Design and Verification of op-amp as integrator and differentiator.
5. Design the 1st order active low pass and high pass filters of given cutoff frequency.
6. Design a Wein`s Bridge oscillator of given frequency.
7. Design clocked SR and JK Flip-Flop`s using NAND Gates.
8. Design 4-bit asynchronous counter using Flip-Flop ICs.
9. Design the CE amplifier of a given gain and its frequency response.

Reference Books:

1. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata Mc Graw Hill.
2. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edn., 2000, Prentice Hall.
3. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994).
4. Digital Electronics, S.K. Mandal, 2010, 1st edition, McGraw Hill.

Semester-III
DSC 1C: Communication Electronics
Theory: 60 Lectures (Credits: 04)

Preamble: This paper explains the principles of operation of many analog and digital communication systems being used for different communication applications.

UNIT-I: Electronic communication: Introduction to communication-means and modes. Need for modulation. Block diagram of an electronic communication system. Brief idea of frequency allocation for radio communication system in (TRAI). Electromagnetic communication spectrum, band designations and usage. Channels and base- band signals. Concept of Noise, signal- to noise (S/N) ratio. **(15 Lectures)**

UNIT-II: Analog Modulation: Amplitude modulation, modulation index and frequency spectrum. Generation of AM (Emitter Modulation). Amplitude Demodulation (diode detector), Concept of Single sided band generation and detection (SHD receiver) Frequency Modulation (FM) and Phase Modulation (PM), modulation index and frequency spectrum, equivalence between FM and AM, Generation of FM using VCO, FM detector (slop detector), Qualitative idea of super heterodyne receiver.
(15 Lectures)

UNIT-III: Analog Pulse Modulation: Channel capacity, Sampling theorem, Basic Principles-PAM, PWM, PPM, Modulation and detection technique for PAM only. Multiplexing. Digital Pulse Modulation: Need of digital transmission, Pulse Code Modulation, Digital Carrier Modulation Technique, Sampling, Quantization and Encoding. Concept of amplitude shift Keying 9ASK). Frequency Shift Keying (FSK), Phase Shifting Keying (PSK), and Binary Phase Shift Keying (BPSk). **(15 Lectures)**

UNIT-IV: Introduction to Communication and Navigation system: Satellite Communication- Introduction, need, Geosynchronous satellite orbits, geostationary satellite, advantages of geostationary satellites. Satellite visibility, transponders (C – Band), path loss, ground station, simplified block diagram of earth station Uplink and downlink.
(15 Lectures)

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Reference Books:

1. Electronic communications, D. Roddy and J. Coolen, Pearson Education India.
2. Advanced Electronics Communication Systems- Tomasi, 6th edddition, Prentice Hall.
3. Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011, Oxford University Press.
4. Electronic Communication Systems, Kennedy, 3rd Edn, 1999, Tata McGraw Hill.
5. Principles of Electronic Communication Systems – Frenzel, 3rd edition, McGraw Hill.
6. Communication Systems S. Haykin, 2006, Wiley India.
7. Electronic Communication Systems, Blake, Cenage, 5th edition.
8. Wireless Communications, Andrea Goldsmith, 2015, Cambiridge University Press.

DSC 1C Lab: Communication Electronics
60 Lectures (Credits: 02)

At least 12 Experiments from following using hardware and simulations:

1. To design an Amplitude Modulator using Transistor.
2. To study envelope Detector for demodulation of AM signals.
3. AF amplifier determination of bandwidth (two state RC-coupled).
4. To study FM-Generator and Detector circuit.
5. To study AM Transmitter and Receiver.
6. To study FM Transmitter and Receiver.
7. Study of characteristics of equalizer (passive component).
8. Study of AGC circuit for AM detector.
9. Study of frequency response of twin-T filter.
10. Study of squelch circuit.
11. To study Time Division Multiplexing (TDM).
12. To study Pulse Amplitude Modulation (PAM).
13. To study Pulse Width Modulation (PWM).
14. To study Pulse Position Modulation (PPM).
15. To study ASK modulation.
16. To study FSK modulation.
17. To study PSK modulation.
18. Linear diode AM detector.
19. IF Amplifier.
20. To study Pre-emphasis and De-emphasis circuits.
21. Frequency Response of Loud speaker.
22. Double tuned amplifier frequency response.
23. To study FET reactance modulator.
24. To study of Single Slope Detector.

Reference Books:

1. Electronic Communication systems, G. Kennedy, 1999, Tata McGraw Hiil.
2. Electronic Communication system, Blake, Cengage, 5th Edition.

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Semester-IV

DSC 1D: Microprocessor and Microcontroller
Theory : 60 Lectures (Credits: 04)

Preamble: This paper helps in understanding the architecture, instructions and programming of 8085 microprocessor and 8051 microcontroller which are the basic and industrial standards. The study of this paper helps in developing different microprocessor and microcontroller based electronic systems.

UNIT-I: Mircocomputer Organization: Input/Output Devices. Data storage (idea of RAM and ROM). Computer memory, memory organization and addressing. Memory Interfacing. Memory Map. 8085 Microprocessor Architecture: Main features of 8085. Block Diagram. Pin-out diagram of 8085. Data and address buses. Registers. ALU. Stack memory. Program counter. **(15 Lectures)**

UNIT-II: 8085 Programming: Instruction classification, Instructions set (Data transfer including stacks arithmetic, logical, branch and control instructions). Subroutines, delay loops. Timing and Control circuitry. Timing states. Instruction cycle, Timing diagram of MOV and MVI. Hardware and software interrupts. **(15 Lectures)**

UNIT-III: 8051 Microcontroller: Introduction and block diagram of 8051 microcontroller, architecture of 8051, overview of 8051 family, 8051 assembly language programming, Program Counter and ROM memory map, Data and directives, Flag bits and Program Status Word (PSW) register, JUMP, LOOP and CALL instructions. **(15 Lectures)**

UNIT-IV: 8051 I/O port programming: Introduction of I/O port programming, pin out diagram of 8051 microcontroller, I/O port pins description and their functions, I/O port programming in 8051 (using assembly language), I/O programming. Bit manipulation. 8051 Programming: 8051 addressing modes and accessing memory locations using various addressing modes, assembly language instructions using each addressing mode, arithmetic and logical instructions, 8051 programming in C: for time dalay and I/O operations and manipulation, for arithmetic and logical operations, for ASCII and BCD conversions. **(15 Lectures)**

Reference Books:

1. Microprocessor Architecture Programming & applications with 8085, 2002, R.S. Goankar, Prentice Hall.
2. Embedded Systems: Architecture Programming & Design, Raj Kamal, 2008, Tata McGraw Hill.
3. The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.
4. Microprocessor and Microcontrollers, N. Senthil Kumar, 2010, Oxford University Press.
5. 8051 microcontroller, Satish Shah, 2010, Oxford University Press.
6. Embedded Systems: Design and Applications, S.F., Barrett, 2008, Pearson Education India.
7. Introduction to embedded system, K.V. Shibu, 1st edition 2009, McGraw Hill.

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8. Embedded Microcomputer systems: Real time interfacing, J.W. Valvano 2011, Cengage Learning.

DSC 1D Lab: Microprocessor and Microcontroller
60 Lectures (Credits: 02)

At least 06 Experiments each from Section-A and Section –B

Section – A : Programs using 8085 Microprocessor:

1. Addition and subtraction of 8-bit numbers using direct addressing mode.
2. Addition and subtraction of 8-bit numbers using indirect addressing mode.
3. Addition and subtraction of 16-bit numbers using direct addressing mode.
4. Addition and subtraction of 16-bit numbers using indirect addressing mode.
5. Program to implement OR, AND and Inversion of an 8-bit number.
6. Program to implement X-OR and X-NOR of an 8-bit number.
7. Program to find 1's and 2's complement of two 8-bit numbers.
8. Find larger among set of numbers.
9. Find smaller among set of numbers.
10. Arrange data in ascending order.
11. Arrange data in descending order.
12. Multiplication by repeated addition.
13. Division by repeated subtraction.
14. Handling of 16-bit Numbers.
15. Use of CALL and RETURN Instruction.
16. Block data handling.
17. Transfer of data in various registers in direct and indirect addressing mode.

Section B: Experiments using 8051 microcontroller:

1. Addition and subtraction of two 8-bit numbers.
2. Addition of two 16-bit numbers.
3. Multiplication of two 8-bit numbers.
4. Division of two 8-bit numbers.
5. Program to implement OR, AND and Inversion of an 8-bit number.
6. Program to implement X-OR and X-NOR of an 8-bit number.
7. Find larger among set of numbers.
8. Find smaller among set of numbers.
9. Arrange data in ascending order.
10. Arrange data in descending order.
11. To find that the given numbers in prime or not.
12. To find the factorial of a number.
13. Write a program to make the two numbers equal by increasing the smallest number and decreasing the largest number.
14. Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's.
15. Program to glow the first four LED's then next four using TIMER application.
16. Program to rotate the contents of the accumulator first right and the left.
17. Program to run a count down from 9-0 in the seven segment LED display.
18. To interface seven segment LED display with 8051 microcontroller and display "HELP" in the seven segment LED display.
19. To toggle '1234' as 1324' in the seven segment LED display.

Reference Books:

1. Microprocessor Architecture Programming & applications with 8085, 2002, R.S. Goankar, Prentice Hall.
2. Embedded Systems: Architecture, Programming & Design, Raj Kamal, 2008, Tata McGraw Hill.
3. The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.
4. 8051 microcontrollers, Satish Shah, 2010, Oxford University Press.
5. Embedded Microcomputer systems: Real time interfacing, J.W. Valvano 2011, Cengage Learning.

SEC-1: Electrical Circuits and Network Skills
Theory: 15 Lectures (Credits: 01)

Preamble: The aim of this course is to enable the students to design and trouble shoots the electrical circuits, networks and appliances through hands-on mode.

UNIT-I: Basic Electricity Principles: Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations. AC and DC Electricity. Familiarization with multimeter, voltmeter and ammeter. Electrical Circuits: Basic electric circuit elements and their combination. Generators and Transformers: DC Power sources. AC/DC generators. Inductance, capacitance, and impedance. Operation and types of transformers. Electric Motors: Single-phase, three-phase & DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor.

(07 Lectures)

UNIT-II: Solid-State Devices: Resistors, inductors and capacitors. Diode and rectifiers. Components in Series or in shunt. Response of inductors and capacitors with DC or AC sources. Electrical Protection: Relays. Fuses and disconnect switches (SPST, SPDT, DPST and DPDT). Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating. Phase reversal. Surge protection. Relay protection device. Electrical Wiring: Different types of conductors and cables. Basics of wiring-Star and delta connection. Voltage drop and losses across cables and conductors. Instruments to measure current, voltage, power in DC and AC circuits. Insulation. Solid and stranded cable. Conduit. Cable trays. Splices: wire nuts, crimps, terminal blocks, and solder. Preparation of extension board.

(08 Lectures)

Reference Books:

1. Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press.
2. A text book in Electrical Technology - B L Theraja - S Chand & Co.
3. A text book of Electrical Technology - A K Theraja.
4. Performance and design of AC machines - M G Say ELBS Edn.

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SEC-1 Lab: Electrical Circuits and Network Skills
15 Lectures (Credits: 01)

At least 06 Experiments from the following:

1. Study of charging of capacitor and determination of time constant.
2. Study of discharging of capacitor and determination of time constant.
3. Study of growth of current in inductor and determination of time constant.
4. Study of decay of current in inductor and determination of time constant.
5. Construct relay as a switch.
6. Study of SPST and SPDT switches.
7. Study of DPST and DPDT switches.
8. Study of resistive ladder circuit excited by the DC voltage.
9. Measurement of voltage and current in resistive series and parallel circuits.
10. Construction of voltmeter.
11. Construction of ammeter.
12. Construction of multimeter.
13. Construction ohm meter.
14. Study of Ohms laws.
15. Study of single phase DC motor.
16. Study of RC series circuits excited by AC source.
17. Study of RL series circuits excited by AC source.
18. Design of extension board.

SEC-2: Analog, Digital and Electronic Communication Skills
15 Lectures (Credits: 01)

Preamble: The aim of this course is to enable the students to understand the analog and digital devices helps in the design and development of analog and digital systems through hands-on mode.

UNIT-I: Sinusoidal Oscillators: Barkhausen criterion for sustained oscillations. Phase shift and Colpitt's oscillator. Unipolar Devices: JFET. Construction, working and I-V characteristics (output and transfer), Pinchoff voltage. UJT, basic construction, working and I-V characteristics.UJT as an relaxation oscillator. Shift registers: Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits). Counters (4 bits): Ring Counter. Asynchronous counters, Decade Counter. Synchronous Counter. D-A and A-D Conversion: 4 bit binary weighted and R-2R D-A converters, circuit and working. A-D conversion characteristics, successive approximation. **(10 Lectures)**

UNIT-II: Mobile Telephony System –Basic concept of mobile communication, frequency bands used in mobile communication, concept of cell sectoring and cell splitting, SIM number, IMEI number, need for data encryption, architecture (block diagram) of mobile communication network, idea of GSM,CDMA, TDMA AND FDMA technologies, simplified block diagram of mobile phone handset, 2G, 3G and 4G concepts (qualitative only). **(05 Lectures)**

Reference Books:

1. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001).

2. Allen Mottershead, Electronic Devices and Circuits, Goodyear Publishing Corporation
3. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw.
4. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
5. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
6. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
7. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994).
8. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw-Hill (1994).
9. Communication Systems S. Haykin, 2006, Wiley India.
10. Electronic Communication Systems, Blake, Cenage, 5th edition.
11. Wireless Communications, Andrea Goldsmith, 2015, CambiridgeUniversity Press.

SEC-2 Lab: Analog, Digital and Electronic Communication Skills
15 Lectures (Credit: 01)

At least 06 Experiments from the following:

1. Study of the I-V Characteristics of UJT.
2. Study of UJT as relaxation oscillator.
3. Study of the output characteristics of FET.
4. Study the transfer characteristic of FET.
5. Study of Fixed Bias circuit of BJT.
6. Study of Voltage divider bias circuit of BJT.
7. Design of a Single Stage CE amplifier of given gain.
8. Study of the RC Phase Shift Oscillator.
9. Study the Colpitt's oscillator.
10. D/A conversion by binary weighted resistor method.
11. D/A conversion by R-2R Ladder method.
12. To build a 4-bit binary Counter using ICs.
13. To make a Shift Register (serial-in and serial-out) using D-type/JK Flip-Flop ICs.
14. Decade counter using IC 7490
15. Study of Ring Counter

DSE 1: Electronic Instrumentation
Theory: 60 Lectures (Credits: 04)

Preamble: This paper helps in understanding the principles and operations of real and virtual electronic instruments used to measure many physical parameters. The significance of electronic transducers is also explained in this paper.

UNIT-I: Measurements: Accuracy and precision. Significant figures. Error and uncertainty analysis. Shielding and grounding. Electromagnetic Interference. Basic Measurement Instruments: DC measurement-ammeter, voltmeter, ohm meter, AC measurement, Digital voltmeter systems (integrating and non-integrating). Digital Multimeter; Block diagram principle of measurement of I, V, C. Accuracy and resolution of measurement. Measurement of Impedance- A.C. bridges, Measurement of

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Self Inductance (Anderson's bridge), Measurement of Capacitance (De Sauty's bridge), Measurement of frequency (Wien's bridge). **(15 Lectures)**

UNIT-II: Oscilloscope: Block Diagram, CRT, Vertical Deflection, Horizontal Deflection. Screens for CRT, Oscilloscope probes, measurement of voltage, frequency and phase by Oscilloscope. Digital Storage Oscilloscopes. LCD display for instruments. Lock-in-amplifier: Basic Principles of phase locked loop (PLL), Phase detector (XOR & edge triggered), Voltage Controlled Oscillator (Basics, varactor), lock and capture. **(15 Lectures)**

UNIT-III: Basic idea of PLL IC (565 or 4046). Lock-in-amplifier, Idea of techniques for sum and averaging of signals. Signal Generators: Function generator, Pulse Generator, (Qualitative only). Virtual Instrumentation: Introduction, Interfacing techniques (RS 232, GPIB, USB), Idea about Audrino microcontroller and interfacing software like lab View). **(15 Lectures)**

UNIT-IV: Transducers: Classification of transducers, Basic requirement/characteristics of transducers, Active and Passive transducers, Resistive (Potentiometer- Theory, temperature compensation & applications), Capacitive (variable air gap type), Inductive (LVDT) & piezoelectric transducers. Measurement of temperature (RTD, semiconductor IC sensors), Light transducers (photo resistors & photovoltaic cells). **(15 Lectures)**

Reference Books:

1. W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall (2005).
2. E.O. Doebelin, Measurement Systems: Application and Design, McGraw Hill Book - fifth Edition (2003).
3. David A. Bell, Electronic Devices and Circuits, Oxford University Press (2015).
4. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Butterworth Heinmann-2008).
5. S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata Mcgraw Hill (1998).
6. Introduction to measurements and instrumentation, 4th Edn., Ghosh, PHI Learning

DSE 1 Lab: Electronic Instrumentation
60 Lectures (Credits: 02)

At least 12 Experiments from the following:

1. Measurement of resistance by Wheatstone bridge and measurement of bridge sensitivity.
2. Measurement of Capacitance by De Sauty's bridge.
3. Measurement of self inductance by Anderson's bridge.
4. Measurement of frequency by Wien's bridge.
5. Conversion of voltmeter into ammeter.
6. Conversion of ammeter into voltmeter.
7. To determine the Characteristics of resistance transducer –(Strain Gauges)
8. Study of PLL.
9. Study of 565 or 4046.

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10. Study of lock-in-amplifier.
11. Study of pulse generator using ICs.
12. Study of signal generator.
13. To determine the Characteristics of LVDT.
14. To determine the Characteristics of Thermistors.
15. To determine the Characteristics of RTD.
16. Measurement of temperature by Thermocouples.
17. To design and study the Sample and Hold Circuit.
18. To plot the frequency response of a microphone.
19. Study of piezoelectric transducer.
20. Study of photo resistor.

Reference Books:

1. W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall (2005).
2. David A. Bell, Electronic Instrumentation & Measurements, Prentice Hall (2013).
3. S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata Mcgraw Hill (1998).
4. Basic Electronics:A text lab manual, P.B.Zbar, A.P.Malvino, M.A.Miller, 1990, Mc-Graw Hill.

SEC-3: Consumer Electronics and Embedded Systems Skills
15 Lectures (Credit: 01)

Preamble: The aim of this course is to enable the students to understand the consumer electronics and embedded systems products helps for trouble shooting and development of embedded systems through hands-on mode.

UNIT-I: Block Diagram of a Power Supply, Qualitative idea of C and L Filters. IC Regulators (78XX and 79XX), adjustable regulator ICs(LM317 and LM 337). Idea of switched mode power supply (SMPS) and uninterrupted power supply (UPS). Applications of SCR: Phase controlled rectification, AC voltage control using SCR and Triac as a switch.

(07 Lectures)

UNIT-II: Introduction to embedded system: Embedded systems and general purpose computer systems. Architecture of embedded system. Classifications, applications and purpose of embedded. Interfacing of 8051: LED, FND, relay, MUX, DE-MUX, Stepper motor, Logic inverter, ADC, DAC and sensor interfacing. Wave form generator: Sine, Square, Pulse, Triangular, saw-tooth and Staircase. Industrial applications of microcontroller.

(08 Lectures)

Reference Books:

1. David A. Bell, Electronic Devices and Circuits, Oxford University Press (2015).
2. Power Electronics, P.C. Sen, Tata McGraw Hill.
3. Power Electronics, M.D. Singh & K.B. Khanchandani, Tata McGraw Hill.
4. Power Electronics Circuits, Devices & Applications, 3rd Edn., M.H. Rashid, Pearson Education.
5. Embedded Microcomputer systems: Real time interfacing, J.W. Valvano 2011, Cengage Learning.

SEC-3 Lab: Consumer Electronics and Embedded Systems Skills
15 Lectures (Credits: 01)

At least 06 Experiments from the following:

1. Design a regulated power supply of given rating (5 V or 9V).
2. Design a regulated power supply of given rating (-5 V or -9V).
3. Design a regulated power supply of given rating (+1.25 V or +9V).
4. Design a regulated power supply of given rating (-1.25 V or -9V).
5. Study of TRIAC as a switch.
6. Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clockwise direction.
7. Application of embedded systems: Temperature measurement & display on LCD.
8. Interfacing of 8051 to LED
9. Interfacing of 8051 to FND
10. Interfacing of 8051 to Relay
11. Interfacing of 8051 to MUX
12. Interfacing of 8051 to DEMUX
13. Interfacing of 8051 to Logic inverter
14. Interfacing of 8051 to ADC
15. Interfacing of 8051 to DAC
16. Interfacing of 8051 to sensor
17. Program to generate waveforms
18. Temperature/Humidity/Speed control system using microcontroller

SEC 4: Electronic Projects
30 Lectures (Credits: 02)

Preamble: The aim of this course is to enable the students to design, develop and trouble shoots the electronic products. And also gives an exposure to understand and develop the Electronics projects for real time applications.

A project of 2 credit may be performed by the candidate. Candidate has to produce the project report and show the demonstration. The evaluation of project work should be done by the teacher. The candidate has to perform the project work related to assembling, design, development, new concept, creativity, application etc covering use of both electronic hardware and software. The electronic skill in the design, development and performance of project should be highlighted.

DSE 4: Photonic Devices and Power Electronics
Theory: 60 Lectures (Credits: 04)

Preamble: The classification and characteristics of photonic and optical devices useful in many communication applications and power electronic devices useful for the constructions of high power electronic systems is explained in this paper.

UNIT-I: Photonic Devices Classification of photonic devices. Interaction of radiation and matter, Radiative transition and optical absorption. Light Emitting Diodes-Construction, materials and operation. Semiconductor Laser- Condition for

amplification, laser cavity, hetero-structure and quantum well devices. Charge carrier and photon confinement, line shape function. Threshold current. Laser diode.

(15 Lectures)

UNIT-II: Photo detectors: Photo conductor. Photo diodes (p-i-n, avalanche) and Photo transistors, quantum efficiency and responsivity. Photomultiplier tube. Solar Cell: Construction, working and characteristic. LCD Displays: Types of liquid crystals, Principle of Liquid Crystal Displays, applications, advantages over LED displays.

(15 Lectures)

UNIT-III: Introduction to Fiber Optics: Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations - Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts-Linearly Polarized Modes -Single Mode Fibers-Graded Index fiber structure.

(15 Lectures)

UNIT-IV: Power Electronics Power Devices: Need for semiconductor power devices, Power MOSFET (Qualitative). Introduction to family of thyristors. Silicon Controlled Rectifier (SCR)- structure, I-V characteristics, Turn-On and Turn-Off characteristics, ratings, Gate-triggering circuits. Diac and Triac- Basic structure, working and V-I characteristics. Application of Diac as a triggering device for Triac. Insulated Gate Bipolar Transistors (IGBT): Basic structure, I-V Characteristics, switching characteristics, device limitations and safe operating area (SOA). **(15 Lectures)**

Reference Books:

1. J. Wilson & J.F.B. Hawkes, Optoelectronics: An Introduction, Prentice Hall India (1996).
2. S.O. Kasap, Optoelectronics & Photonics, Pearson Education (2009).
3. AK Ghatak & K Thyagarajan, Introduction to fiber optics, Cambridge Univ. Press (1998).
4. Power Electronics, P.C. Sen, Tata McGraw Hill.
5. Power Electronics, M.D. Singh & K.B. Khanchandani, Tata McGraw Hill.
6. Power Electronics Circuits, Devices & Applications, 3rd Edn., M.H. Rashid, Pearson Education.
7. Optoelectronic Devices and Systems, Gupta, 2nd edn., PHI learning.
8. Electronic Devices and Circuits, David A. Bell, 2015, Oxford University Press.

DSE 4 Lab: Photonic Devices and Power Electronics
60 Lectures (Credits: 02)

At least 12 Experiments from the following:

1. To determine wavelength of sodium light using Michelson's Interferometer.
2. Study of Laser diode.
3. Diffraction experiments using a laser.
4. Study of Electro-optic Effect.
5. Study of optical communication.
6. To determine characteristics of LEDs.
7. Study of Photo voltaic cell.
8. Study of Photo diode.
9. Study of photo transistor.
10. Study of solar cell.
11. To study the Characteristics of LDR.

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12.To measure the numerical aperture of an optical fiber.
13.Output and transfer characteristics of a power MOSFET.
14.Study of I-V characteristics of SCR.
15.Study of SCR as a half wave rectifier with and without filter.
16.Study of SCR as full wave rectifier with and without filter.
17.AC voltage controller using TRIAC with UJT triggering.
18.Study of I-V characteristics of DIAC.
19.Study of I-V characteristics of TRIAC.
20.Study of triggering characteristics of power devices.
21.Study of switching characteristics of power devices.
22.Application of high power devices.

Reference Books:

1. AK Ghatak & K Thyagarajan, Introduction to fiber optics, Cambridge Univ. Press (1998).
2. Power Electronics, M.D. Singh & K.B. Khanchandani, Tata McGraw Hill.
3. Power Electronics Circuits, Devices & Applications, 3rd Edn., M.H.Rashid, Pearson Education.
4. A Textbook of Electrical Technology-Vol-II, B.L. Thareja, A.K. Thareja, S.Chand.

Professor and Chairman
Dept. of Applied Electronics
Gulbarga University
GULBARGA 585 106

GULBARGA UNIVERSITY
Dept. of Post Graduate Studies & Research in Applied Electronics
Kalaburagi – 585 106, Karnataka - India

Office of the Chairman

Phone: +91-08472-263288
Fax: +91-08472-263206

Proceedings of the UG BOS meeting held on 09.06.2018 in the Department of Applied Electronics, Gulbarga University, Kalaburagi.

The following members were present.

1.	Prof. S. N. Mulgi, DOAE, GUK	Chairman
2.	Prof. J. S. Kadadevaramath, KUD	Ext. Member
3.	Prof. K. Madhukar, OUH	Ext. Member
4.	Dr. S. T. Sulepetkar, SSC, Kalaburagi	Int. Member
5.	Sri. B. H. Sharanagounda, LVDC, Raichur	Int. Member
6.	Sri. Shivaji Jagtap, CBC, Bhalki	Int. Member

UG BOS meeting resolutions:

1. With reference to the University Circular No. GUK/Accd/B.O.S./2018-19/364 Dt: 29/5/18 for the implementation of under graduate CBCS scheme by the University from the academic year 2018-19, the concerned matter was discussed in detail in the meeting. As per the format given by the Director, PMEB, GUK the B.Sc CBCS syllabus of Semester- I to VI has been prepared by referring the Electronics syllabus suggested by UGC, New Delhi. The existing UGC Electronics syllabus is partially modified within 20% in order to implement the syllabus effectively.
2. Out of seven, skill enhancement courses (SEC) available in the UGC syllabus, only one paper namely, Electrical Circuits and Network Skills has been selected for the V semester, which is more relevant to Electronics. As per the UGC guidelines for CBCS, two skills papers such as i) Analog, Digital and Electronic Communication Skills and ii) Consumer Electronics and Embedded Systems Skills have been proposed and accordingly prepared. Since the project in Electronics subject is very much essential for the students, which helps the students expose to the latest technology in the field of Electronics and enable them to design and develop electronic systems for real time applications. Hence, an Electronic Project which was in the earlier non-CBCS syllabus of Electronics VI semester has been retained without changing the credits.
3. If any suitable corrections or modifications need to be incorporated, the board has authorized the Chairman to do so.
4. The meeting ended with thanks by Chairman to all the internal and external members for their valuable inputs in preparing the syllabus.

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