KARNATAK UNIVERSITY, DHARWAD
ACADEMIC (S&T) SECTION
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಧಾರವಾಡ
ವಿದ್ಯಾಮಂಡಳ (ಎಸ್&ಟಿ) ವಿಭಾಗ

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'A' Grade 2014

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ಅಧಿಸೂಚನೆ

ವಿಷಯ: 2020–21ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸಗಳಿಗೆ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್ ಸಿ.ಬಿ.ಸಿ.ಎಸ್. ಮಾದರಿಯ ಪಠ್ಯಕ್ರಮವನ್ನು ಅಳವಡಿಸಿರುವ ಕುರಿತು.

ಉಲ್ಲೇಖ: 1. DO No. 1-1/2016(SECY), dt. 10.08.2016.
2. Academic Council Res. No. 2, 21.05.2020.
3. KU/Aca(S&T)/RIH-194/20-21/71, dt. 08.06.2020.
4. KU/VCS/2020-21, dt. 11.08.2020.
5. ಮಾನ್ಯ ಕುಲಪತಿಗಳ ಆದೇಶ ದಿನಾಂಕ 13.08.2020.

ಮೇಲ್ಕಾಣಿಸಿದ ವಿಷಯ ಹಾಗೂ ಉಲ್ಲೇಖಗಳಿಗೆ ಸಂಬಂಧಿಸಿದಂತೆ, 2020–21ನೇ ಶೈಕ್ಷಣಿಕ ಸಾಲಿನಿಂದ ಎಲ್ಲ ಸ್ನಾತಕ ಕೋರ್ಸಗಳ 1 ಮತ್ತು 2ನೇ ಸೆಮಿಸ್ಟರ್‌ಗಳಿಗೆ ಸಿ.ಬಿ.ಸಿ.ಎಸ್. ಮಾದರಿ ಪಠ್ಯಕ್ರಮವನ್ನು ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಅನುಮೋದನೆಯನ್ನು (Pending Approval of Academic Council Meeting) ನಿರೀಕ್ಷೆಯಲ್ಲಿರಿಸಿ ಅಳವಡಿಸಲಾಗಿದೆ.

ಮುಂದುವರೆದು, ಈ ಮೇಲಿನ ಸಿ.ಬಿ.ಸಿ.ಎಸ್. ಪಠ್ಯಕ್ರಮವು ಕ.ವಿ.ವಿ. ಅಂತರ್ಜಾಲ www.kud.ac.in ದಲ್ಲಿ ಬಿತ್ತರಿಸಲಾಗಿದೆ ಎಂದು ಈ ಮೂಲಕ ತಿಳಿಸಲಾಗಿದೆ.

13/08/2020

(ಡಾ. ಹನುಮಂತಪ್ಪ ಕೆ.ಟಿ)
ಕುಲಸಚಿವರು

ಗೆ,
ಕರ್ನಾಟಕ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಬರುವ ಎಲ್ಲ ಅಧೀನ ಹಾಗೂ ಸಂಲಗ್ನ ಮಹಾವಿದ್ಯಾಲಯಗಳ ಪ್ರಾಚಾರ್ಯರುಗಳಿಗೆ.

ಪ್ರತಿ ಮಾಹಿತಿಗಾಗಿ: ಡೀನರು, ಕಲಾ, ಸಮಾಜ ವಿಜ್ಞಾನ, ವಿಜ್ಞಾನ ಹಾಗೂ ತಂತ್ರಜ್ಞಾನ, ವಾಣಿಜ್ಯ, ಕಾನೂನು, ಶಿಕ್ಷಣ ಮತ್ತು ಮ್ಯಾನೇಜಮೆಂಟ್ ನಿಖಾಯ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.

ಪ್ರತಿ:
1. ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕುಲಪತಿಗಳ ಕಾರ್ಯಾಲಯ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
2. ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕುಲಸಚಿವರ ಕಾರ್ಯಾಲಯ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
3. ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿಗಳು, ಕುಲಸಚಿವರು(ಮೌಲ್ಯಮಾಪನ) ಕಾರ್ಯಾಲಯ, ಕ.ವಿ.ವಿ. ಧಾರವಾಡ.
4. ನಿರ್ದೇಶಕರು, ಇಂಟರನೆಟ್ ಸೆಕ್ಷನ್, ಪರೀಕ್ಷಾ ವಿಭಾಗ, ಕವಿವಿ, ಧಾರವಾಡ.
5. ಅಧೀಕ್ಷಕರು, ಸಿಡಿಸಿ (ಸಂಯೋಜನೆ) ವಿಭಾಗ, ಕವಿವಿ, ಧಾರವಾಡ

CBCS syllabus w.e.f. 2020-21
B.Sc. FIRST SEMESTER
Optional Subject: PHYSICS(DSC-PHYT:101)
Mechanics and properties of Matter
(Credits:Theory-04, Practicals-02) Theory: 60 Hours

Newtonian Mechanics:

Frames of References(5 hours):

Inertial frames, Galilean transformation equations (derivation), Invariance of Newton's Laws under Galilean Transformations, Invariance of the laws of conservation of momentum and energy under Galilean transformations, Non-inertial frames and fictitious force(in brief), rotating frame of reference, concept of the Coriolis force and mention of its expression.

Linear Momentum (10 hours):

Linear Momentum, Law of conservation of linear momentum for a system of particles, Centre of mass of a system of particles, Position coordinates of the Centre of Mass, Motion of center of mass, collision between two particles which stick together (inelastic collision, one dimentional) and do not stick together (elastic collision, two dimensional) in laboratory frame of reference and in the centre of mass frame of reference , Conservation of linear momentum in case of variable mass: examples i) Single stage rocket (expression for velocity neglecting the weight) ii) Double stage rocket(derivation for final velocity).

Angular momentum(5 hours):

Angular momentum and its relation to angular velocity, Torque and its relation to angular velocity, Relation between angular momentum and Torque, Law of conservation of angular momentum, Work done by a Torque, Central force, Kepler's second law of Planetary motion (derivation).

Classical Mechanics(15 hrs):

Constraints (Holonomic, Non-holonomic,Scleronomic, and Rheonomic constraints with examples), Degrees of freedom, space point and configuration space, virtual displacement andprinciple of virtual work, Generalized co-ordinates, Generalised velocity and generalized force, D'Alembert's Principle, Derivation of Lagrange's equation of motion using D'Alembert's Principle (For holonomic case), some applications of the Lagrangianmethod: Newton's equation of motion from Lagrange equations, Simple pendulum, Atwood's machine & Linear Harmonic Oscillator.Qualitative discussion on Hamiltonian formulation.

Special Theory of Relativity (10 hours):

The Michelson-Morley experiment, Significance of negative result. Postulates of special theory of relativity. The Lorentz transformationequations (Derivation), Length contraction, Time dilation, Simultaneity, Twin paradox, Addition of velocities, Variation of mass with velocity, Mass-Energy Equivalence (with derivation).Space-Time diagram: Minkowski'sfour dimensional space-time.

Gravitation (5 hours):

Newton's Law of Gravitation. Determination of Gravitational constant by Cavendish's method. Density and mass of the Earth. Satellite in circular orbit andGeosynchronous orbits. Weightlessness. Basic idea of global positioning system(GPS). Qualitative discussions on applications of artificial satellites.

Elasticity (6 hours):

Stress, Strain, Elastic limit, Hooke's law, Modulii of elasticity for isotropic materials, Relation between elastic constants (Derivation), Poisson's Ratio, Work done for unit Volume in stretching a wire, Bending of Beams- Neutral surface, Neutral axis, Plane of Bending, Bending Moment, Expression for bending moment (Derivation), uniform bending (mention formula), Theory of light cantilever (Derivation), Torsion expression for the couple per unit twist.

Cathode Ray Oscilloscope(4 hours, without numerical problem):

Introduction to CRO, Basic diagram of CRT: Brief introduction to Electron Beam,Operating voltage, Deflecting plates,Deflecting voltages, Phosphor Screen. Block diagram of CRO: Brief mention of functions of Verticle and Horizontal Amplifier, Delay Line, Time Base, Trigger Circuit, Power supply and brief explanation of waveform display. Mention of uses of CRO.

Note:

1. **Number of teaching hours per week are four.**
2. **Total teaching hours are inclusive of solving numerical problems on all the topics.**
3. **Preference may be given to solve maximum number of numerical problems.**

Reference books:

1. Mechanics (VI-Edition) - J.C.Upadhyay –Ramprasad & Sons,Agra, 2005.
2. Mechanics (XX-Edition) – D.S.Mathur- S. Chand & Company Ltd., New-Delhi, 2007.
3. Mechanics & Electrodynamics (XVII-Edition, Course- 1 & 2) – Brijlal, Subramanyam & Jivan Seshan, S. Chand & Company Ltd., New-Delhi, 2008.
4. Properties of Matter (XIII-Edition) – Brijlal & Subramanyam, Eurasia Publishing House Pvt. Ltd., New-Delhi, 2001.
5. Elements of Properties of Matter (XXVIII-Edition), D.S.Mathur - S. Chand & Company Ltd., New-Delhi, 2005.
6. Physics , Vol. No.I (V-Edition)– Resnick, Halliday & Krane – John Wiley & Sons Inc., New-York, Singapore, 2005.
7. Berkely Physics, Vol. No.I – ABC Publications, Bangalore & New-Delhi.
8. University Physics (XI-Edition)- Young & Freedman – Pearson Education, 2004.
9. Principles of Physics (V-Edition)- Serway& Jewett , THOMSON
   BROOKS/COLE.
10. Classical Mechanics(X Ed)- Takwale and Puranik-Tata.McGraw Hill,Newdehli,1989.
11. Classical Mechanics(XIV ed)- Gupta,Kumar & Sharma.
12. Classical Mechanics(XVII ed)- Goldstein-Narosa Publishing Newdehli,1998.
13. Introduction to Relativity- R.Resnik.
14. Relativistic Mechanics- Gupta and Kumar.
15. Physics For Degree Students B. Sc. First Year, S. Chand & Company.
16. Electronics Instrumentation by H S Kalasi.
17. B.Sc. practical Physics – C.L.Arora.
18. Advanced practical Physics – Samir Kumar Ghosh.
19. Advanced practical Physics – Worsnop and Flint.

List of first semester Physics(DSC-PHYP:102)Experiments:

1. Estimation of errors(Average deviation, Standard deviation, standard error and Probable error) in the experimental determination of physical quantities like length, diameter, thickness, time, mass, temperature and resistance from the given data. And also fit the given data to a straight line graph and calculate from the given observations Standard deviation, standard error and Probable error.
2. To study (i) the law of conservation of linear momentum, (ii)the law of conservation of kinetic energy and (iii) to calculate coefficient of restitution using one dimensional apparatus of two hanging spheres.
3. Moment of Inertia of the Fly-Wheel.
4. Bar pendulum/Kater's Pendulum.
5. Verification of Parallel axes theorem of Moment of Inertia using Bar Pendulum.
6. Y- by bending using Cantilever.
7. Modulus of Rigidity of a wire using disc/ Maxwell's needle.
8. To find Youngs modulus, modulus of rigidity and poisson's ratio for the material of a wire by Searle's method.
9. To determine gravitational constant 'G'by Cavendish Method.
10. Use of CRO – Measurement of AC and DC voltage. Measurement of frequency of sine and square waves.
11. Problem based learning in physics: Problems on classical mechanics, gravitation (especially on satellite communication), special theory of relativity, rigid body dynamics and center of mass of different bodies.
12. Simulation experiments(if any demonstration purpose only).
13. Use of both analog and digital Multimeters for measuring(a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electricalfuses. (Demonstration purpose only).

Note:

1. **Experiments are of four hours duration.**
2. **Minimum of Eight experiments to be performed.**
3. **Any new experiment may be added to the list with the prior approval from the BOS.**

CBCS syllabus w.e.f. 2020-21
B.Sc. SECOND SEMESTER
Optional Subject: PHYSICS(DSC-PHYT:201)
Thermal Physics and Fluid Mechanics
(Credits:Theory-04, Practicals-02) Theory: 60Hours

Thermodynamics (15 hours):

Review of basic concepts.

Heat engines: Otto engine, Otto cycle and expression for efficiency. Diesel engine, Diesel cycle, expression for efficiency and Carnot's theorem.

Entropy: Concept of entropy, change in entropy in reversible and irreversible processes, entropy-temperature diagram, second law of thermodynamics.

Enthalpy, Helmoltz, Gibbs and Internal energy functions, Relation among these functions.

Maxwell's Thermodynamical relations(with derivation). Applications of Maxwell's Thermodynamical relations: (i) to derive Clausius-Clapeyron's latent heat equation and (ii) Joule-Thomson expansion.

Kinetic theory of gases(10 hours):

Maxwell's law of distribution of velocities (qualitative) & its experimental verification by Zartman and Ko method. Expressions for Average, r.m.s. & most probable velocities(with derivation). Qualitative discussions on Mean free path, mention of Clausius and Maxwell's expressions for mean free path. Transport phenomena — Brief discussion on Viscosity, Thermal conductivity and Diffusion. Expressions for Coefficient ofViscosity, Coefficient of Thermal conductivity and Coefficient of Diffusion (with derivations) and relation between them.Theory of Brownian motion, Einstein's expression for coefficient of Diffusion from the knowledge of mean square displacement and partial pressure difference(with derivation), Determination of Avogadro's number by Perrin method.

Statistical Physics (5 hours):

Introduction to statistical Physics, Statistics of identical particles – Derivation for distribution functions in case of Maxwell-Boltzmannstatistics, Bose-Einsteinstatistics and Fermi-Dirac statistics and the comparision between them.

Radiation(7 hours):

Concept of Radiation and Radiation pressure(qualitative), Stefan's law & its derivation using radiation pressure. Laboratory method for determination of Stefan's constant. Wein's displacement law(with derivation), Rayleigh-Jeans's law (qualitative), Planck's law of radiation & its derivation. Ferry's total radiation Pyrometer.

Astrophysics (8hours):

Units of stellar distances: light year and Parsec,luminosities of stars, absolute and apparent magnitude,relation between absolute,apparent magnitude and distance. Expression for radius of the star. Spectral classification of stars: E. C. Pickering classification (Harvard classification). H-R diagram, main sequence stars, general properties of main sequence stars.Surface temperature of star and its color, linear density model of star, expression for average temperature of star, binary stars, stellar masses. Evolution of stars to white dwarfs, different stages, formation of neutron stars and black holes (qualitative).

Fluid Mechanics(15 hours):

Surface Tension:Review of basics of Surface Tension. Pressure difference across a liquid surface: Excess pressure inside a spherical liquid drop and Excess pressure inside a soap Bubble. Derivation of relation between radius of curvature, pressure and Surface tension.Angle of Contact: Case of two liquids in contact with each other and with air, case of solid, liquid and air in contact. Theory of Rise of liquid in a capillary tube. Experimental determination of surface tension by Jeager's method with relevant theory.

Viscosity: Viscosity of a liquid, Expression for co-efficient of viscosity, Expression for Critical velocity, Significance of Reynold's number.Derivation of Poiseuille's equation. Experimental determination of co-efficient of viscosity for a liquid by Poiseuille's method. Motion of a spherical body in a viscous medium: Expression for co-efficient of viscosity fromStoke's law, Theory of Rotation Viscometer.

Note:

1. **Number of teaching hours per week are hour.**
2. **Total teaching hours are inclusive of solving numerical problems on all the topics.**
3. **Preference may be given to solve maximum number of numerical problems.**

Reference books:

1. Kinetic Theory of Gases(I-Edition) – V.N.Kelkar – Ideal Book Service, Pune, 1967.
2. Kinetic Theory of Gases(II-Edition) – R.S.Bhoosnurmath – IBH Prakashana, Bangalore, 1981.
3. Heat & Thermodynamics and Statistical Physics(XVIII-Edition) – Singhal, Agarwal & Satyaprakash – Pragati Prakashan, Meerut, 2006.
4. Heat & Thermodynamics and Statistical Physics(I-Edition) – Brijlal , Subramanyam & Hemne - S. Chand & Company Ltd., New-Delhi, 2008.
5. Heat and Thermodynamics (I-Edition) – D.S.Mathur - S. Chand & Company Ltd., New-Delhi, 1991.
6. A Treatise on Heat – Shaha and Srivatsava.
7. A text book of heat - J.B.Rajam.
8. Properties of Matter (XIII-Edition) – Brijlal & Subramanyam, Eurasia Publishing House Pvt. Ltd., New-Delhi, 2001.
9. Elements of Properties of Matter (XXVIII-Edition), D.S.Mathur - S. Chand & Company Ltd., New-Delhi, 2005.
10. Physics , Vol. No.I (V-Edition)– Resnick, Halliday & Krane – John Wiley & Sons Inc., New-York, Singapore, 2005.
11. Berkely Physics, Vol. No.I – ABC Publications, Bangalore & New-Delhi.
12. University Physics (XI-Edition)- Young & Freedman – Pearson Education, 2004
13. Introduction to Astrophysics(XV ed)- Baidyanath Basu-Prantice Hall of India-2006.
14. Astrophysics(III ed)- K.D.Abhyankar-Universities Press India Pvt. Ltd. 2009.
15. Introduction to Astrophysics and Astronomy- M. Zeilik, Gregory and Smith.
16. B.Sc. practical Physics – C.L.Arora.
17. Advanced practical Physics – Samir Kumar Ghosh.
18. Advanced practical Physics – Worsnop and Flint.

List of second semester Physics(DSC-PHYP:202) Experiments:

1. To study the adiabatic expansion of a gas and hence to find the value of ratio of specific heat (γ) at constant pressure to specific heat at constant volume for air using Clement and Desorme's apparatus.
2. Lee's method of determination of thermal conductivity of a bad conductor.
3. Verification of Stefan's Law (Electrical method).
4. 'J' by continuous flow method.
5. Determination of thermal conductivity of copper by Searle's method.
6. Determination of Stefan's constant.
7. Surface Tension by Jeager's method.
8. Surface Tension by Quincke's method.
9. H-R Diagram: Study of classification of stars and stellar evolution.
10. To determine the Coefficient of Viscosity of water by Capillary Flow method (Poiseuille'smethod).
11. Use of CRO- Study of Lissajous figures and determination of Phase Shift using CR network by continuous wave method and Lissajous figures.
12. Problem based learning in physics: Problems on entropy, heat engines, fluid mechanics and statistical physics.

Note:

1. **Experiments are of four hours duration.**
2. **Minimum of Eight experiments to be performed.**
3. **Any new experiment may be added to the list with the prior approval from the BOS.**

CBCS syllabus w.e.f. 2020-21
B.Sc. FIRST SEMESTER
Optional Subject: ELECTRONICS(DSC-ELET:101)
BASIC ELECTRONICS
(Credits:Theory-04, Practicals-02) Theory: 60 Hours

Circuit Analysis(08hours):

Concept of voltage and urrentsources. Superposition theorem.Thevenin's theorem. Norton's theorem.Reciprocity theorem.Maximum power transfer theorem. Two port networks: z,y and h parameters and their interconversions.

Measuring Instruments(07 hours):

Principle of voltmeter, multirange voltmeter (AC and DC), loading effect.Principle of ammeter, multirange ammeter (AC and DC),Principle of Ohmmeter, series and shunt type ohmmeter. Multimeters: Analog and digital multimeters(qualitative).

CRO: Use of CRO (frequency, voltage ,phase, Lissajous pattern).

Junction Diode and its applications(15 hours):

p-n junction diode (Ideal and practical): Construction, Formation of depletion layer, and V-I characteristics. Static and dynamic resistance, dc load line and Quiescent point(Q).Zener diode: V-I characteristics, Reverse saturation current, Zener and avalanche breakdown.Rectifiers: Half wave rectifier, Full wave rectifierand bridgerectifier(Circuit diagrams, working and waveforms, ripple factor and efficiency). Filters: Shunt capacitor filter-working, output waveform and its role in power supply. Regulation: Line and load regulation. Zener diode as voltage regulator.

Bipolar Junction Transistor(BJT)&FET (15 hours):

Transistor, Types of transistors, characteristics of transistor in CE and CB configurations. Regions of operation (active, cut off and saturation), Current gains(α and β) and relations between them. dc load line and Q point. Transistor biasing circuits: Fixed Bias and Voltage Divider Bias(Thermal runaway, stability and stability factor S). h-parameter analysis of a transistor in CE mode.

FET:FET types, JFET-Construction, working, characteristics, parameters and the relation between them.

Amplifiers and Oscillators (15 hours):

Small signal analysis of single stage RC coupled CE amplifier using h-parameters. Expressions forinput & output impedance, current and voltage gains. Two stage RC Coupled CE amplifier and its frequency response. Class A, B and C amplifiers (qualitative).

Feedback in Amplifiers: Concept of feedback,negative and positive feedback,

expression for gain with feedback (negative and positive feedback). Working of emitter follower circuit. Advantages of negative feedback.

Sinusoidal Oscillators: Barkhausen criterion for sustained oscillations. Phase shift, Wein bridge and Colpitt'soscillators-condition for oscillation and expression for frequency.

Note:

4. **Number of teaching hours per week are four.**
5. **Total teaching hours are inclusive of solving numerical problems on all the topics.**
6. **Preference may be given to solve maximum number of numerical problems.**

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.
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.
5. Electronic Devices and Circuits, David A. Bell, 5th Edition 2015.
6. Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove.
7. Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning.
8. Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6thEdn.
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.
11. Allen Mottershead, Electronic Devices and Circuits, Goodyear.

List of first semester ELECTRONICS(DSC-ELEP:102) Experiments:

1. Measurement of amplitude, frequency &phase difference using CRO(Demonustartion only).
2. h-parameters of a two port network.
3. Verification of Thevenin's and Norton's theorems.
4. Verification of Superposition theorem/Reciprocity theorem.
5. Verification of maximum power transfer theorem.
6. Half wave rectifier and Full wave rectifier.
7. Bridge Rectifier with C- filter and π- section filter.
8. Zener diode as voltage regulator.
9. FETcharacteristics.
10. Study of Fixed Bias and Voltage divider bias for CE mode.
11. Design a Single Stage RC coupled CE amplifier and study its frequency response.
12. Study of RC Phase Shift oscillator/Wein bridge oscillator.
13. Study of Colpitt's oscillator.

Note:

4. **Experiments are of four hours duration.**
5. **Minimum of Eight experiments to be performed.**
6. **Any new experiment may be added to the list with the prior approval from the BOS.**

CBCS syllabus w.e.f. 2020-21
B.Sc. SECOND SEMESTER
Optional Subject: ELECTRONICS(DSC-ELET:201)
LINEAR AND DIGITAL INTEGRATEDCIRCUITS
(Credits: Theory-04, Practicals-02) Theory: 60 Hours

Integrated circuits(03 hours):Introduction, classification ofIC's, comparsion between different IC's and advantages.

Operational Amplifiers& its applications (12 hours):Block Diagram of Op-amp, Characteristics of an Ideal and practical Op- amp(IC 741), Operational amplifier parametrs, Open and closed loop configurations and frequency response. Concept of virtual ground.

Applications: Inverting and Non-inverting amplifiers, summing and difference amplifier, differentiator, Integrator, Wein bridge oscillator, Comparator and Zero-crossing detector, and active low pass and high pass Butterworth filter (First order only).

Clock and Timer (IC 555): Introduction, Block diagram of IC 555, Astable and monostablemultivibrator circuits.

Number System,Boolean Algebra and Logic gates (15 hours):

Number System: Decimal, Binary, Octal and Hexadecimal number systems and their interconversions. Representation of signed and unsigned numbers.Addition and subtraction by 1's &2's complement method.BCD, Gray& ASCII code. Binary to Grey conversion and vice-versa.

Boolean algebra: Basic postulates and fundamental theorems of Boolean algebra,positive and negative logic.

Logic Gates: Study of basic gatesOR, AND, NOT. Derived gates NOR, NAND, XOR, XNOR. Universal property of NAND and NOR gates.Realisation of Boolean equation using logic gates. deMorgan'stheorems and its applications.Logic families: RTL, DTL, TTL, and CMOSand their characteristics.

Combinational Logic Analysis and Design (15 hours): Standard representation of logic functions (SOP and POS), minimization Techniques,Karnaughmapminimization up to 4variables for SOP.

Arithmetic Circuits: Half and Full Adder, Half and Full Subtractorand 4- bit binaryAdder and Subtractor. Two bit comparator,encoder,decimal to BCD Priorityencoder, decoder 2:4 using AND gates and 3:8 using NAND gates. BCD to decimaldecoder. Multiplexer (4:1 using gates) and demultiplexer (1:4 using gates).

Digital to analog(D/A) and Analog to Digital(A/D): 4 bit binary weighted and R-2R D-A converters, working, accuracy and resolution.A/D conversion characteristics, successive approximation ADC. (Mention of relevant ICs for all).

Sequential Circuits(15 hours): RS, 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.

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: Asynchronous counters-logic diagram, truth table and timing diagram of 3-bit ripple counter, 3-bit up-down asynchronous counter and decade counter. Ring Counter, Johnson counter and their applications.

Note:

1. **Number of teaching hours per week are four.**
2. **Total teaching hours are inclusive of solving numerical problems on all the topics.**
3. **Preference may be given to solve maximum number of numerical problems.**

Reference Books:

1. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000.
2. Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011.
3. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed..
4. Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009.
5. Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
6. Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001.
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List of Second semester ELECTRONICS(DSC-ELEP:202) Experiments

1. Design inverting and non-inverting amplifier using Op-amp(741) for dc/ac voltages & study its frequency response.
2. Op-amp asan adder using inverting/non-inverting mode and comparator.
3. Op-amp as Integrator and Differentiator.
4. Wein bridge oscillator using an op-amp.
5. Design a Butterworth low pass active filter (1^{st} order) & study its frequency response.
6. Design a digital to analog converter.
7. Design a combinational logic system for (i) a givenBoolean expression and (ii) Truth table. Realise it using logic gates.
8. Half Adder and Full Adder/ Half Subtractor and Full Subtractor.
9. Seven segment decoder.
10. MonostableMultivibrator using IC 555 Timer.
11. JK Master-slave flip-flop using Flip-Flop ICs.
12. Counter using D-type/JK Flip-Flop ICs.
13. Grey to binary condition and vice-versa.
14. Verification of deMorgan's theorem.

Note:

1. **Experiments are of four hours duration.**
2. **Minimum of Eight experiments to be performed.**
3. **Any new experiment may be added to the list with the prior approval from the BOS.**