# **SCHEME OF EXAMINATION**

&

**SYLLABI** 

for

# Bachelor of Technology Programmes of Studies under the aegis of University School of Information and Communication Technology offered at Affiliated Institutions of the University

(1st Year Common Scheme and Syllabus & Scheme of Studies for higher semesters)



Prain Chamdra

Guru Gobind Singh Indraprastha University Sector 16C, Dwarka, Delhi – 110 078 [INDIA]

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## **Programme Outcomes**

1. Engineering Knowledge (PO01): Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem Analysis (PO02): Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first

principles of mathematics, natural sciences and engineering sciences.

Design/Development of Solutions (PO03): Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct Investigations of Complex Problems (PO04): Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

for complex problems:

a. that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline as against problems given at the end of chapters in a typical text book that can be solved using simple engineering theories and techniques;

b. that may not have a unique solution. For example, a design problem can be

solved in many ways and lead to multiple possible solutions;

c. that require consideration of appropriate constraints / requirements not explicitly given in the problem statement such as cost, power requirement, durability, product life, etc.;

d. which need to be defined (modelled) within appropriate mathematical

framework; and

e. that often require use of modern computational concepts and tools, for example, in the design of an antenna or a DSP filter.

5. Modern Tool Usage (PO05): Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6. The Engineer and Society (PO06): Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the

consequent responsibilities relevant to the professional engineering practice.

7. Environment and Sustainability (PO07): Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics (PO08): Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and Team Work (PO09): Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication (PO10): Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to

- comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project Management and Finance (PO11): Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long Learning (PO12): Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

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## Course / Paper Group Codes:

BS: Basic Science

HS: Humanities, social science, management

ES: Engineering Science

MC: Mandatory courses PC: Programme Core, that is course / paper offered in the discipline of the programme as a compulsory paper.

PCE: Programme Core Elective, that is elective course / paper offered in the discipline of the programme.

EAE/OAE: Emerging Area Elective offered by institutions or open area electives offered in the institution

#### Definitions:

Batch: The batch of the student shall mean the year of the first time enrolment of the students in the programme of study in the first semester. Lateral entry students admitted in the 3rd semester / 2<sup>nd</sup> year shall be designated as students admitted in the previous batch as they are admitted one year later. A student re-admitted in a programme of study in a lower / later batch shall be considered as the student of the original batch for the purpose calculation of duration of study.

Programme of study shall mean Bachelor of Technology.

Major specialization shall mean the discipline in which the student is admitted / upgraded or transferred.

Minor specialization shall mean the specializations earned through the EAE or OAE route subject to fulfilment of requirements specified in the scheme of study for the concerned minor specialization.

Acronyms:

APC: Academic programme committee comprising of all faculty of the department / institutions and as defined in the implementation rules and the Ordinance 11 of the University.

L: Number of Lecture hours per week

T/P: Number of Tutorial / Practical Hours per week

C: Number of credits assigned to a course / paper

COE: Controller of Examinations of the Examinations Division of the University.

SGPA/CGPA: Semester/Cumulative Grade Point Average.

NUES: No term end examination shall be held. The evaluation shall be conducted as per the scheme of examinations as described in the scheme of study.

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# FIRST YEAR

# Common Scheme and Syllabus for

Bachelor of Technology Programmes of Study under the aegis of University School of Information and Communication Technology offered at Affiliated Institutions of the University

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		First Semester			
Group	Code	Paper	L	Р	Credits
Theory Pa		P			
ES	ES101	*Any one of the following: Programming in 'C' Applied Chemistry	3		3
BS	BS103 BS105	Applied Physics - I	3	4	3
ES DE	ES107 BS109	*Any one of the following: Electrical Science Environmental Studies	3	-	3
BS	BS111	Applied Mathematics - I	4	-	4
BS HS	HS113	**Group 1 or Group 2 shall be offered: Group 1: Communications Skills OR	3	-	3
HS	HS115 HS117	Group 2: Indian Constitution Human Values and Ethics	2 1		2
HS ES	ES119	Manufacturing Process	4	-	4
	l/Viva Voce	Manufacturing 1 100000			
BS	BS151	Physics-I Lab	-	2	1
ES	ES153 BS155	Any of the following corresponding to the theory paper offered: Programming in 'C' Lab Applied Chemistry		2	1
BS ES	ES157	Engineering Graphics-I	-	4	2
ES BS	ES157 ES159 BS161	Any of the following corresponding to the theory paper offered: Electrical Science Lab Environmental Studies Lab		2	1
Total	D3101	the forest was a first study one out of these two D	20	10	25

\*For a particular batch of a programme of study one out of these two papers shall be taught in the first semester while the other shall be taught in the 2<sup>nd</sup> semester. Students who have to re-appear can only reappear in the odd semester if originally offered to the student in the 1<sup>nd</sup> semester and similarly for the students who study the paper in the second semester. The institution shall decide which paper to offer in which semester.

\*\* For a particular batch of a programme of study either the paper on "Communications Skills" (Group 1), or Group 2: papers ("Indian Constitution" and "Human values and ethics") shall be taught in the first semester while the other group shall be taught in the 2<sup>nd</sup> semester. Students who have to re-appear can only reappear in the odd semester if originally offered to the student in the 1<sup>st</sup> semester and similarly for the students who study the paper(s) in the second semester. The institution shall decide which paper group to offer in which semester.

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		Second Semester			
Group	Paper Code	Paper	L	Р	Credits
Theory Pa	apers			-	
ES BS	ES102 BS104	*Any one of the following: Programming in 'C' Applied Chemistry	3	-	3
BS	BS106	Applied Physics - II	3	-	3
ES BS	ES108 BS110	*Any one of the following: Electrical Science Environmental Studies	3	-	3
BS	BS112	Applied Mathematics - II	4		4
HS	HS114	**Group 1 or Group 2 shall be offered: Group 1: Communications Skills OR	3	-	3
HS HS	HS116 HS118	Group 2: Indian Constitution Human Values and Ethics	2		2
ES ·	ES114	Engineering Mechanics	3	-	3
Practical/	Viva Voce				
BS	BS152	Physics-II Lab	- 1	2	1
ES BS	ES154 BS156	*Any of the following corresponding to the theory paper offered: Programming in 'C' Lab Applied Chemistry	-	2	1
ES	ES158	Engineering Graphics-II	-	2	1
ES BS	ES160 BS162	*Any of the following corresponding to the theory paper offered: Electrical Science Lab Environmental Studies Lab	-	2	1
ES	ES164	Workshop Practice		4	2
Total	4		19	12	25

\*For a particular batch of a programme of study one out of these two papers shall be taught in the first semester while the other shall be taught in the 2<sup>nd</sup> semester. Students who have to re-appear can only reappear in the odd semester if originally offered to the student in the 1<sup>st</sup> semester and similarly for the students who study the paper in the second semester. The institution shall decide which paper to offer in which semester.

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Introduction to Programming: Computer system, components of a computer system, computing environments, computer languages, creating and running programs, Preprocessor, Compilation process, role of linker, idea of invocation and execution of a programme. Algorithms: Representation using flowcharts, pseudocode. Introduction to C language: History of C, basic structure of C programs, process of compiling and running a C program, C tokens, keywords, identifiers, constants, strings, special symbols, variables, data types, I/O statements. Interconversion of variables.

Operators and expressions: Operators, arithmetic, relational and logical, assignment operators, increment and decrement operators, bitwise and conditional operators, special operators, operator precedence and associativity, evaluation of expressions, type conversions in expressions.

Control structures: Decision statements; if and switch statement; Loop control statements: while, for and do while loops, jump statements, break, continue, goto statements.

Arrays: Concepts, One dimensional array, declaration and initialization of one dimensional arrays, two dimensional arrays, initialization and accessing, multi dimensional arrays.

Functions: User defined and built-in Functions, storage classes, Parameter passing in functions, call by value Passing arrays to functions: idea of call by reference, Recursion.

Strings: Arrays of characters, variable length character strings, inputting character strings, character library functions, string handling functions.

Pointers: Pointer basics, pointer arithmetic, pointers to pointers, generic pointers, array of pointers, functions returning pointers, Dynamic memory allocation. Pointers to functions. Pointers and Strings

Structures and unions: Structure definition, initialization, accessing structures, nested structures, arrays of structures, structures and functions, self referential structures, unions, typedef, enumerations. File handling: command line arguments, File modes, basic file operations read, write and append. Scope and life of variables, multi-file programming. [8Hrs][T2]

#### Unit IV

C99 extensions. 'C' Standard Libraries: stdio.h, stdlib.h, assert.h, math.h, time.h, ctype.h, setjmp.h, string.h, stdarg.h, unistd.h [3Hrs] [T1, R8]
Basic Algorithms: Finding Factorial, Fibonacci series, Linear and Binary Searching, Basic Sorting Algorithms-Bubble sort, Insertion sort and Selection sort. Find the square root of a number, array order reversal, reversal of a string [7Hrs][T1]

#### Textbooks:

- 1. How to solve it by Computer by R. G. Dromey, Prentice-Hall India EEE Series, 1982.
- 2. The C programming language by B W Kernighan and D M Ritchie, Pearson Education, 1988.

#### References:

- 1. Programming Logic & Design by Tony Gaddis, Pearson, 2nd Ed. 2016.
- 2. Programming Logic and Design by Joyce Farrell, Cengage Learning, 2015.
- 3. Engineering Problem Solving With C by Delores M. Etter, Pearson, 2013.
- 4. Problem Solving and Program Design in C by Jeri R. Hanly and Elliot B. Koffman, Pearson, 2016.
- Structure and Interpretation of Computer Programs by Harold Abelson and Gerald Sussman with Julie Sussman, MIT Press, 1985.
- 6. How to Design Programs by Matthias Felleisen, Robert Bruce Findler, Matthew Flatt, and Shriram Krishnamurthi, MIT Press, 2018.
- 7. ANSI/ISO 9899-1990, American National Standard for Programming Languages 'C' by American National Standards Institute, Information Technology Industry Council, 1990 (C89).
- 8. ISO/IEC 9899:1999. International Standard for Programming Languages C (ISO/IEC 9899) by American National Standards Institute, Information Technology Industry Council, 2000 (C99).
- 9. INCITS/ISO/IEC 9899-2011. American National Standard for Programming Languages 'C' by American National Standards Institute, Information Technology Industry Council, 2012 (C11).

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Fuels: Classification and Characteristics of fuels, Calorific values, Comparison between solid, liquid and gaseous fuels, calorimeter, Calorific value of fuel, Theoretical calculation of calorific value of a fuel, Types of fuels: Solid (coal), Liquid (Petroleum products, refining, cracking, synthetic petrol, Knocking and rating), Gaseous (Natural, CNG, LPG, Coal gas, Oil gas, Producer Gas, Water gas), Non-Conventional sources of energy. Water treatment: Introduction, Hardness of water, Disadvantages of hard water, Water usage in Industries, boiler problems with hard water, Water-softening, Drinking Water, Desalination, Defluoridation, Waster Water Management, Chemical Analysis of Water, and corrosion (effect, type, mechanism, control).

Phase rule: Phase diagram, Water System, Sulphur System, Two Component System (Pb-Ag, Zn-Mg, Fe-C), Metalals, Alloys, Heat treatment of steel.

Polymers: Classification, functionality, Mechanism of Polymerization, Molecular weight of Polymers, Plastics, Rubbers, Fibres, Specialty Polymers, Degradation of Polymers, Polymer Composites, Adhesives. Lubricants: Functions, Mechanism of lubrication, classification, synthetic and natural lubricants, lubricating

[9Hrs][71, T2]

emulsions, properties, selection on the basis of usage.

Spectroscopic Techniques: Basic principles of spectroscopic methods. Electronic (UV-Visible) spectroscopy, IR spectroscopy, Rotational and Vibrational-Rotational Spectroscopy of diatomic molecules, NMR, Raman

Thermodynamics: The laws (zeroth, 1st and 2nd), Heat Capacity, Ideal Gases and Thermodynamic processes (isothermal, adiabatic), laws of thermochemistry, Kichhoff's eqs., Joule-Thomson effect, Entropy and its usage in thermodynamic systems, Gibbs - Helmholtz equation, Claypeyron - Clausius eq., Maxwell's relations, spontaneity and equilibrium.

#### Unit IV

Green Chemistry: Principles, Biofuels, Innocuous Reagents, Alternative Solvents, Design of safer chemicals, minimizing energy consumption.

Nanochemistry: Properties, Synthesis and characterization of Nanomaterials, Applications.

Chemical Aspects of Biotechnology: Biocatalysts or Enzymes, Fermentation, Outline of fermentation process. [9Hrs][T2]

#### Textbooks:

- 1. Applied Chemistry by Achyutananda Acharya and Biswajit Samantray, Pearson, 2017.
- 2. Engineering Chemistry: Fundamentals and Applications by Shikha Agarwal, Cambridge University Press,

#### References:

- 1. Applied Chemistry: A Textbook of Engineers and Technologists by O. V. Roussk and H. D. Gesser, Springer, 2013.
- 2. Engineering Chemistry by Raghupati Mukhopadhyay and Sriparna Datta, New Age Int. (P0 Ltd., 2007.
- 3. Engineering Chemistry by K. Shesha Maheswaramma and Mridula Chugh, Pearson, 2017.
- 4. Basic Engineering Chemistry by S.S. Dara, A. K.Singh, and Abhilasha Asthana, S. Cand and Co., 2012.
- 5. Engineering Chemistry by K. N. Jayaveera, G.V. Subba Reddy, and C. Ramachandraiah, McGraw Hill, 2016.
- 6. Engineering Chemistry by O. G. Palanna, McGraw-Hill, 2017.
- 7. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley, 2017.
- 8. Engineering Chemistry by E.R. Nagarajan and S. Ramalingam, Wiley, 2017.

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3:	To under	stand an	d model	interfere	ence, dif	fraction	and pola	rization	phenome	non.		
4:	To under	stand an	d apprec	iate rela	tivistic s	systems a	nd Laser	s.				
	Outcome	s (CO).										
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CO2:	Ability to	underst	and and	model o	scillation	ns and wa	ives.					
CO3:	Ability to	underst	and and	model in	nterferer	nce, diffr	action a	nd polari	zation ph	nenomen	on.	
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## Unit I

CO2 CO3 CO4

Introduction to Thermodynamics: Fundamental Ideas of Thermodynamics, The Continuum Model, The Concept of a "System", "State", "Equilibrium", "Process". Equations of state, Heat, Zeroth Law of Thermodynamics, Work, first and second laws of thermodynamics, entropy

Waves and Oscillations: Wave motion, simple harmonic motion, wave equation, superposition principle. Introduction to Electromagnetic Theory: Maxwell's equations. work done by the electromagnetic field, Poynting's theorem, Momentum, Angular momentum in electromagnetic fields, Electromagnetic waves: the wave equation, plane electromagnetic waves, energy carried by electromagnetic waves

#### Unit III

Interference: Interference by division of wave front (Young's double slit experiment, Fresnel's biprism), interference by division of amplitude (thin films, Newton's rings, Michelson's interferometer), Coherence and coherent sources

Diffraction: Fraunhofer and Fresnel diffraction; Fraunhofer diffraction for Single slit, double slit, and N-slit (diffraction grating), Fraunhofer diffraction from a circular aperture, resolving power and dispersive power of a grating, Rayleigh criterion, resolving power of optical instruments

Polarization: Introduction to polarization, Brewster's law, Malu's law, Nicol prism, double refraction, quarterwave and half-wave plates, optical activity, specific rotation, Laurent half shade polarimeter. [12Hrs]

## Unit IV

Theory of relativity: The Michelson-Morley Experiment and the speed of light; Absolute and Inertial frames of reference, Galilean transformations, the postulates of the special theory of relativity, Lorentz transformations, time dilation, length contraction, velocity addition, mass energy equivalence. Invariance of Maxwell's equations under Lorentz Transformation.

Introduction to Laser Physics: Introduction, coherence, Einstein A and B coefficients, po bulation inversion. basic principle and operation of a laser, the He-Ne laser and the Ruby laser

[12Hrs]

1

Prain Chamdra

### Textbooks:

Concepts of Modern Physics (SIE) by Arthur Beiser, Shobhit Mahajan, and S. Rai Choudhury, McGraw-Hill, 2017. Physics for Scientists and Engineers by Raymond A. Serway and John W. Jewett, 9th Edition, Cengage, 2017

## References:

- 1. Modern Physics by Kenneth S. Krane, Wiley, 2020.
- 2. Principles of Physics by Robert Resnick, Jearl Walker and David Halliday, Wiley, 2015.
- 3. Optics by Ajoy Ghatak, McGraw Hill, 2020.

Pravir Chamdra

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#### Unit - I

DC Circuits: Passive circuit components, Basic laws of Electrical Engineering, Temperature Resistance Coefficients. voltage and current sources, Series and parallel circuits, power and energy, Kirchho 's Laws, Nodal & Mesh Analysis, delta-star transformation, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem. Time domain analysis of first Order RC & LC circuits.

[9Hrs] [T1]

## Unit - II

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

[9Hrs] [T1]

#### Unit - III

D. C. Generators & Motors: Principle of operation of Generators & Motors, Speed Control of shunt motors, Flux control, Rheostatic control, voltage control, Speed control of series motors.

A. C. Generators & Motors: Principle of operation, Revolving Magnetic field, Squirrel cage and phase wound rotor, Starting of Induction motors, Direct on line and Star Delta starters, Synchronous machines. [9Hrs [T1]]

#### Unit - IV:

Transformers: Construction and principle of operation, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Measuring Instruments: Electromagnetism, Different Torques in Indicating instruments, Moving Iron Instruments: Construction & Principle, Attraction and Repulsion type; Moving Coil instruments: Permanent Magnet type; Dynamometer type Instruments.

[9Hrs] [T1]

#### Textbooks:

1. Electrical Engineering Fundamentals by Vincent Del Toro, PHI (India), 1989

#### References

1. An Introduction to Electrical Science by Adrian Waygood, Routledge, 2 Ed. 2019.

Horamin Chand

Approved by BoS of USICT:31/10/2021,

Applicable from Batch Admitted in Academic Session 2021-22 Onwards

Approved by AC sub-committee: 22/11/2021

Page 15 of 49

- 2. Electrical Circuit Theory and Technology by John Bird, Elsevier, 2007.
- 3. Principles and Applications of Electrical Engineering by Giorgio Rizzoni, MacGraw-Hill, 2007.
- 4. Electrical Engineering by Allan R. Hambley, Prentice-Hall, 2011.
  5. Hughes Electrical & Electronic Technology by Edward Hughes revised by Hohn Wiley, Keith Brown and Ian McKenzie Smith, Pearson, 2016.
- 6. Electrical and Electronics Technology by E. Hughes, Pearson, 2010.
- 7. Basic Electrical Engineering by D.C. Kulshrestha, McGraw-Hill, 2009.
- 8. Basic Electrical Engineering by D. P. Kothai and I.J. Nagrath, McGraw-Hill, 2010.

Pravir Chandra

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Unit I Fundamentals: The Multidisciplinary nature of environmental studies: Definition, components, scope and importance, need for public awareness; Natural Resources. Ecosystems: Concept, Structure and function of an ecosystem, Types, Functional Components, Different ecosystems, biogeochemical cycles.

ecosystems, biogeochemical cycles.

Biodiversity: Introduction to biodiversity, biogeographical classification, India as a mega diversity nation,

endangered and endemic species of India, threats to biodiversity and conservation of biodiversity. Bioprospecting and Biopiracy.

[ST, IT] [S1HOI]

**FOO** 

Unit III

Environmental Pollution: (a) Air Pollution: Source, Types, effects on biosphere and Meterology, Air Quality, Control. (b) Water Pollution: Types and Sources. (c) Soil Pollution: Types and Control. (d) Noise Pollution: Effect, Control (e) Thermal Pollution. (f) Radiation Pollution (g) Solid waste Management, (h) Pollution Prevention, (i) Disaster Management

[10Hrs][T1,T2]

Onternation; Wasteland reclamation; Resettlement and Rehabilitation; Concept of Sustainable Development; Urban problem related to energy; Water Conservation; Wasteland reclamation; Resettlement and Rehabilitation; Forest and Wild life; Environmental Consumerism and Waste Products; Laws related to Environment, Pollution, Forest and Wild life; Environmental Impact Assessment.

Human Population and Environment: Population Growth, Human Rights, Family Welfare Programmes, Environment and Human Health, HIV/AIDS, Women and Child Welfare, Role of IT. [8Hrs] [T1,T2]

Handbook of B. Tech. Programmes offered by USICT at Affiliated Institutions of the University.

#### Textbooks

- 1. Environmental Studies by Anindita Basak, Pearson, 2009.
- 2. Environmental Studies: Simplified by Benny Joseph, McGraw-Hill, 2017.

#### References:

- 1. Environmental Studies by D. L. Manjunath, Pearson, 2007.
- 2. Environmental Studies by Anil Kumar De and Arnab Kumar De, New Age Int. (P) Ltd, Publishers, 2005.
- 3. Companion to Environmental Studies edited by Coel Castree, Mike Hulme, and James D. Proctor, Routledge, 2018.
- Environmental Studies by Deepa Sharma and Bhupendra Singh Chabbra, New Age Int. (P) Ltd, Publishers, 2007.
- 5. Environmental Studies: Simplified by Raj Kumar Singh, McGraw-Hill, 2012.
- 6. Basics of Environmental Studies by U. K. Khare, McGraw-Hill, 2014.

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Pravi Chambra

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Partial derivatives, Chain rule, Differentiation of Implicit functions, Exact differentials. Maxima, Minima and saddle points, Method of Lagrange multipliers. Differentiation under Integral sign, Jacobians and transformations of coordinates.

[8Hrs][T2]

Unit II

Ordinary Differential Equations (ODEs): Basic Concepts. Geometric Meaning of y' = f(x, y). Direction Fields, Euler's Method, Separable ODEs. Exact ODEs. Integrating Factors, Linear ODEs. Bernoulli Equation. Population Dynamics, Orthogonal Trajectories. Homogeneous Linear ODEs with Constant Coefficients. Differential Operators. Modeling of Free Oscillations of a Mass-Spring System, Euler-Cauchy Equations. Wronskian, Nonhomogeneous ODEs, Solution by Variation of Parameters.

Power Series Method for solution of ODEs: Legendre's Equation. Legendre Polynomials, Bessel's Equation, [12Hrs][T1] Bessels's functions Jn(x) and Yn(x). Gamma Function

Linear Algebra: Matrices and Determinants, Gauss Elimination, Linear Independence. Rank of a Matrix. Vector Space. Solutions of Linear Systems and concept of Existence, Uniqueness, Determinants. Cramer's Rule, Gauss-Jordan Elimination. The Matrix Eigenvalue Problem.

Determining Eigenvalues and Eigenvectors, Symmetric, Skew-Symmetric, and Orthogonal Matrices. Eigenbases.

Diagonalization. Quadratic Forms. Cayley - Hamilton Theorem (without proof)

[10Hrs][T1]

Page 20 of 49

Vector Calculus: Vector and Scalar Functions and Their Fields. Derivatives, Curves. Arc Length. Curvature. Torsion, Gradient of a Scalar Field. Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field, Line Integrals, Path Independence of Line Integrals, Double Integrals, Green's Theorem in the Plane, Surfaces for Surface Integrals, Surface Integrals, Triple Integrals, Stokes Theorem. Divergence Theorem of Gauss. [10Hrs][T1]

Textbooks:

1. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley, 10th Ed., 2011.

2. Mathematical Methods for Physics and Engineering, by K. F. Riley, M. P. Hobson and S. J. Bence, CUP, 2013. (for Unit I)

#### References:

1. Engineering Mathematics by K.A. Stroud with Dexter J. Booth, Macmillan, 2020.

2. Advanced Engineering Mathematics by Larry Turyn, Taylor and Francis, 2014.

3. Advanced Engineering Mathematics by Dennis G. Zill, Jones & Bartlett Learning, 2018.

4. Advanced Engineering Mathematics with MATLAB by Dean G. Duffy, Taylor and Francis, 2017.

5. Advanced Engineering Mathematics by Merle C. Potter, Jack L. Lessing, and Edward F. Aboufadel, Springer (Switzerland), 2019.

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Porani Chamdra

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3:	To under	stand ho	w to writ	e a busi	ness lett	er and m	nake a sp	eech.				
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Role and Importance of Communications, Attributes of Communications, Verbal and Non-Verbal Communications, Verbal Communications Skills, Non-verbal Communication Methods, Body Language, Barriers to Communications, Socio-psychological barriers, Inter-Cultural barriers, Overcoming barriers, Communication Mediums: Characterization and Choice of medium, Effective Communication: Correctness, Clarity, Conciseness, Courtesy, Group Communication: Meetings (types, purpose), Group Discussions, Conduct of Meeting, Participant Role, Making Presentations. [8Hrs][T1]

Unit II Spoken and Written English: Attributes of spoken and written communication, Formal & Informal Communication, Variation in between Indian, British and American English. Etiquette and Manners: Personal Behaviour, Greetings, Introductions, Telephone Etiquette. Vocabulary Development: Dictionaries and Thesaurus, Words often confused, generally used one word substitutions, Comprehension. [8Hrs][T1]

Letter writing: Planning the message, Planning Content, Structure, Language use, Layout, enquires and replies, asking for or giving quotations, Bargaining letters, Seller's reply, etc.; Complaints and Replies; Memos, Circulars and notices;

Papragraph Writing, Writing Scientific and Technical Reports: Types, Structure, Drafting and Delivering a Speech: Understanding the Environment, Understanding the Audience, Text, preparing, Composition, Practicing, Commemorative Speeches, Welcome and Introduction, Farewell and Send offs, Condolence [8Hrs][T1]

Articles: Indefinite, Definite; Tenses: Present, Past, Future, Perfect (Present, Past and Future), Tenses in Unit IV conditional sentences; Active and Passive Voice: Formation, conversion; Direct and Indirect Speech, Degrees of [8Hrs][T1] Comparison, Common errors, Concepts of Learning and Listening

Textbooks:

1. English Language Communication Skills by Urmilla Rai, Himalaya Publishing House, 10th Ed., 2010.

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#### References:

- Technical Communication: Principles and Practice by Meenakshi Raman and Sangeeta Sharma, Oxford University Press, 2015.
- 2. Communication Skills for Engineers by C. Muralikrishna and Sunita Mishra, Pearson, 2011.
- 3. Effective Technical Communication by M. Ashraf Rizvi, McGraw-Hill, 2018.
- 4. Business Communication: Skills, Concepts, and Applications by P.D. Chaturvedi and Mukesh Chaturvedi, Pearson, 2013.
- 5. Business Correspondence and Report Writing by R.C. Sharma and Krishan Mohan, McGraw-Hill, 2016.
- 6. English for Technical Communications by Aysha Viswamohan, Tata McGraw-Hill, 2008.

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Poranin Chamdra

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Introduction to Constitution of India: Definition, Source and Framing of the Constitution of India. Salient Features of the Indian Constitution. Preamble of the Constitution. [6Hrs]

Unit II Fundamental Rights and Duties: Rights To Equality (Article 14-18). Rights to Freedom (Article 19-22). Right against Exploitation (Article 23-24). Rights to Religion and Cultural and Educational Rights of Minorities (Article 25- 30). The Directive Principles of State Policy - Its significance and application. Fundamental Duties -Necessary obligations and its nature, legal status and significance [6Hrs]

Unit III

Executives and Judiciary: Office of President, Vice President and Governor: Power and Functions, Parliament, Emergency Provisions-, President Rule; Union Judiciary: Appointment of Judges, Jurisdiction of the Supreme Court, State Judiciary: Power and functions, Writ Jurisdiction

Centre- States Relation: Is Indian Constitution Federal in Nature, Legislative relations between Union and States, Administrative Relations between Union and States, Financial Relations between Union and States [6Hrs]

Textbooks:

1. Constitutional Law of India by J.N Pandey, Central Law Publication, 2018.

2. Introduction to the Indian Constitution of India by D.D. Basu, PHI, New Delhi, 2021

3. The Constitution of India by P.M. Bakshi, Universal Law Publishing Co., 2020.

1. Indian Constitutional Law by M.P. Jain, Lexis Nexis, 2013

2. Constitution of India by V.N. Shukla, Eastern Book Agency, 2014

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#### Unit I

Human Values: Morals, Values, Ethics, Integrity, Work ethics, Service learning, Virtues, Respect for others, Living peacefully, Caring, Sharing, Honesty, Courage, Valuing time, Cooperation, Commitment, Empathy, Self-confidence, Challenges in the work place, Spirituality [3Hrs]

#### Unit II

Engineering Ethics: Senses of engineering ethics, Variety of moral issues, Types of inquiries, Moral dilemma, Moral autonomy, Moral development (theories), Consensus and controversy, Profession, Models of professional roles, Responsibility, Theories about right action (Ethical theories), Self-control, Self-interest, Customs, Religion, Self-respect, Case study: Choice of the theory

Engineering as experimentation, Engineers as responsible experimenters, Codes of ethics, Industrial standards, A balanced outlook on law, Case study: The challenger [3Hrs]

## Unit III

Safety definition, Safety and risk, Risk analysis, Assessment of safety and risk, Safe exit, Risk-benefit analysis Sefety lessons from 'the challenger', Case study: Power plants, Collegiality and loyalty, Collective bargaining, Confidentiality, Conflict of interests, Occupational crime, Human rights, Employee rights, Whistle blowing, Intellectual property rights.

[4Hrs]

## Unit IV

Globalization, Multinational corporations, Environmental ethics, Computer ethics, Weapons development, Engineers as managers, Consulting engineers, Engineers as expert witness, Engineers as advisors in planning and policy making, Moral leadership, Codes of ethics, Engineering council of India, Codes of ethics in Business Organizations

#### Textbooks

1. A Textbook on Professional Ethics and Human Values, by R. S. Naagarazan, New Age Publishers, 2006.

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#### References:

- 1. Professional Ethics and Human Values by D. R. Kiran, McGraw-Hill, 2014.
- 2. Engineering Ethics, by Charles E Harris and Micheal J Rabins, Cengage Learning Pub., 2012.
- 3. Ethics in Engineering, Mike Martin and Roland Schinzinger, McGraw Hill Pub., 2017.
- 4. Unwritten laws of Ethics and Change in Engineering by The America Society of Mechanical Engineers, 2015.
- Engineering Ethics by Charles B. Fleddermann, Pearson, 2014.
- 6. Introduction to Engineering Ethics by Mike W. Martin and Roland Schinzinger, McGraw-Hill, 2010.
- 7. Engineering Ethics: Concept and Cases by Charles E. Harris, Michael S. Pritchard and Michael J.Rabins, Cengage, 2009.
- 8. Ethics in Engineering Practice and Research by Caroline Whitbeck, Cambridge University Press, 2007.

Nomin Chambra

	erCode: ES		Paper	r: Manuf	acturing	Process					L	T/P	C
	erID: 19911										4		4
Mark	king Schem	e:											
	1. Teache												
	<ol><li>Term e</li></ol>	nd Theo	ry Exami	nations:	75 marks	S							
	uction for												
1. T	There should	d be 9 qu	uestions i	n the te	rm end e	xaminat	ions ques	tion pap	er.				
2.	The first (1 objective, s	st) quest	ion shou	ld be co	mpulsor	v and co	over the	entire s	vllabus.	This que	estion	shou	ld be
3 4	hart from	nigle line	1 which	is comp	deony re	type que	estion of	total 15	marks.				
J. F	part from overy unit	chall have	e two	uestions	coverin	a the c	paper s	nall cons	SIST OF 4 I	units as p	per tr	ne syll	abus.
-	tudent shal	I he ask	ed to att	empt of	aly one o	of the tu	o guesti	one in th	t or the	Syllabus	. 110	wever	, the
c	ontain upto	5 sub-n	arts / sul	h-questi	ons Fact	I Init sh	all have	ons in u	voightag	o of 15	it que	Stions	may
4. 7	The question	ins are t	o be fra	med ke	ening in	view the	e learnin	a marks i	mes of t	be cours	0/	2222	The
S	tandard / le	evel of t	he questi	ons to b	e asked s	hould be	at the l	evel of t	he nresc	rihad tay	thool	paper	. The
5. T	he requirer	nent of	(scientific	c) calcul	ators / lo	og-tables	/ data -	tables	nav he sr	necified i	f real	n. Hirad	
Cour	se Objectiv	es:	+	-/		,5 tabica	, data	CUDICS II	idy be sp	ecilica i	тец	un eu.	
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#### Unit I

Definition of manufacturing, Importance of manufacturing towards technological and social economic development, Classification of manufacturing processes, Properties of materials.

Metal Casting Processes: Sand casting, Sand moulds, Type of patterns, Pattern materials, Pattern allowances, Types of Moulding sand and their Properties, Core making, Elements of gating system. Description and operation of cupola.

Working principle of Special casting processes - Shell casting, Pressure die casting, Centrifugal casting defects. [10Hrs]

## Unit II

Joining Processes: Welding principles, classification of welding processes, Fusion welding, Gas welding, Equipments used, Filler and Flux materials. Electric arc welding, Gas metal arc welding, Submerged arc welding, Electro slag welding, TIG and MIG welding process, resistance welding, welding defects.

[10Hrs]

#### Unit III

Deformation Processes: Hot working and cold working of metals, Forging processes, Open and closed die forging process. Typical forging operations, Rolling of metals, Principle of rod and wire drawing, Tube drawing. Principle of Extrusion, Types of Extrusion, Hot and Cold extrusion.

Sheet metal characteristics -Typical shearing operations, bending and drawing operations, Stretch forming operations, Metal spinning. [10Hrs]

#### Unit IV

Powder Metallurgy: Introduction of powder metallurgy process, powder production, blending, compaction, sintering

Manufacturing Of Plastic Components: Types of plastics, Characteristics of the forming and shaping processes, Moulding of Thermoplastics, Injection moulding, Blow moulding, Rotational moulding, Film blowing, Extrusion, Thermoforming. Moulding of thermosets- Compression moulding, Transfer moulding, Bonding of Thermoplastics.

[10Hrs]

Approved by BoS of USICT:31/10/2021,

Applicable from Batch Admitted in Academic Session 2021-22 Onwards

Approved by AC sub-committee: 22/11/2021

Page 27 of 49

#### Textbooks:

- 1. Manufacturing Technology: Foundry, Forming and Welding Volume 1, P. N Rao, , McGrawHill, 5e, 2018.
- 2. Elements of Workshop Technology Vol. 1 and 2 by Hajra Choudhury, Media Promoters Pvt Ltd., 2008.

- 1. Manufacturing Processes for Engineering Materials, by Serope Kalpajian and Steven R.Schmid, Pearson Education, 5e, 2014.
- 2. Fundamentals of Modern Manufacturing: Materials, Processes, and Systems by Mikell P. Groover, John Wiley and Sons, 4e, 2010.
- 3. Production Technology by R.K.Jain and S.C. Gupta, Khanna Publishers. 16th Edition, 2001.

Pravir Chamdra

PaperCode: BS151		Paper:	Paper: Applied Physics - I Lab.				C
Pa	perID: 99151					7	1
		Continuous	40 marks	Term End Examinations	60 /	Marks	-
1.	The practical lis	nent of the co t shall be not e office of the	rresponding theory   ified by the teacher e Head of Departme	in the first week of the class conent / Institution in which the paper	mencer	nent i	nder

- 1. To determine the wavelength of sodium light by Newton's Rings.
- 2. To determine the wavelength of sodium light by Fresnel's biprism.
- 3. To determine the wavelength of sodium light using diffraction grating.
- 4. To determine the refractive index of a prism using spectrometer.
- 5. To determine the dispersive power of prism using spectrometer and mercury source.
- 6. To determine the specific rotation of cane sugar solution with the help of half shade polarimeter.
- 7. To find the wavelength of He-Ne laser using transmission diffraction grating.
- 8. To determine the numeral aperture (NA) of an optical fibre.
- 9. To plot a graph between the distance of the knife-edge from the center of the gravity and the time period of bar pendulum. From the graph, find (a) The acceleration due to gravity (b) The radius of gyration and the moment of inertia of the bar about an axis.
- 10. To determine the velocity of ultrasound waves using an ultrasonic spectrometer in a given liquid (Kerosene Oil).
- 11. To verify inverse square law.
- 12. To determine Planck's constant.

Note: Teacher's may use the prescribed books to choose the practicals in addition to above. Total 8 practicals minimum shall be performed by the students, they may be asked to do more. Atleast 4 experiments must be from the above list.

#### Textbook:

- 1. B.Sc. Practical Physics by C. L. Arora, S.Chand & Co., 2020.
- 2. Practical physics by R. K. Shukla and A. Srivastava, New Age Int. (P) Ltd., 2006.

1

Pravi Chamdra

D	Paper: Programmin	g in 'C' Lab.	L	Р	C
PaperCode: ES153 / ES154	raper. rrogiamimi	5 0	-	2	1
PaperID: 199153 / 199154 Teachers Continuo Evaluation:	ous 40 marks	Term End Examinations:	60 A	Marks	

#### Instructions:

1. The course objectives and course outcomes are identical to that of "Programming in 'C'" as this is the practical component of the corresponding theory paper.

The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 8 experiments must be performed by the

- 1. Write a program to find divisor or factorial of a given number.
- 2. Write a program to find sum of a geometric series
- 3. Write a recursive program for tower of Hanoi problem
- 4. Write a recursive program to print the first m Fibonacci number
- 5. Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices
  - a. Addition of two matrices
  - b. Subtraction of two matrices
  - c. Finding upper and lower triangular matrices

  - d. Transpose of a matrixe. Product of two matrices.
- 6. Write a program to copy one file to other, use command line arguments.
- 7. An array of record contains information of managers and workers of a company. Print all the data of managers and workers in separate files.
- 8. Write a program to perform the following operators on Strings without using String functions
  - a. To find the Length of String.
  - To concatenate two string.

  - c. To find Reverse of a string.d. To copy one string to another string.
- 9. Write a Program to store records of a student in student file. The data must be stored using Binary File.Read the record stored in "Student.txt" file in Binary code.Edit the record stored in Binary File.Append a record in the Student file.
- 10. Write a programmed to count the no of Lowercase, Uppercase numbers and special Characters presents in the contents of text File.

1. At least 8 Experiments out of the list shall be performed by the students. Teachers may introduce new experiments for the class in addition to above.

2. In addition Two Mini Projects based on the skills learnt shall be done by the students. Teachers shall create the mini projects so that the same is not repeated every year. These mini projects may be done in a group not exceeding group size of 4 students.

3. Usage of IDE like Visual Studio Community Edition, Codeblocks, etc. are recommended.

Prawi Chambra

PaperCode: BS155 /	BS156	Paper: Applied Che	mistry Lab.	L	Р	C
PaperID: 99155 / 99156				-	2	1
Teachers Evaluation:	Continuous	40 marks	Term End Examinations:	60 A	Marks	
Instructions:  1. The course obje	ectives and co	urse outcomes are id	dentical to that of "Applied Chemist	rv" as	this is	s the

- The course objectives and course outcomes are identical to that of "Applied Chemistry" as this is the
  practical component of the corresponding theory paper.
- 2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 8 experiments must be performed by the students
- 1. Determination of alkalinity of water sample.
- 2. Determination of hardness of water sample by EDTA method.
- 3. Determine the percentage composition of sodium hydroxide in the given mixture of sodium hydroxide and sodium chloride.
- 4. Determine the amount of oxalic acid and Sulphuric acid in one litre of solution, given standard sodium hydroxide and Potassium Permanganate.
- Determine the amount of copper in the copper ore solution, provided hypo-solution (lodometric Titration).
- Determine the amount of chloride ions present in water using silver nitrate (Mohr's Precipitation Method).
- 7. Determine the strength of MgSO4 solution by Complexometric titration.
- 8. Determine the surface tension of a liquid using drop number method.
- 9. Determine the viscosity of a given liquid (density to be determined).
- 10. Determine the cell constant of conductivity cell and titration of strong acid/strong base conductometrically.
- To determine (a) λ max of the solution of KMnO4. (b) Verify Beer's law and find out the concentration of unknown solution by spectrophotometer.
- 12. Determination of the concentration of iron in water sample by using spectrophotometer.
- 13. Determination of the concentration of Iron (III) by complexometric titration.
- 14. Proximate analysis of coal.
- Determination of eutectic point and congruent melting point for a two component system by method of cooling curve.

#### References:

- 1. Vogel's Text Book of Quantitative Chemical Analysis by G.H. Jefferey, J. Bassett, J. Mendham, and R.C. Denney, Logmaan Scientific & Technical, 1989
- 2. Essentials of Experimental Engineering Chemistry by S. Chawla, Dhanpat Rai & Co., 2008.
- 3. Experiments in Applied Chemistry by S. Ratan, S.K. KAtaria & Sons, 2003.
- 4. Practical Chemistry by O.P.Pandey, D. N. Bajpai and S. Giri, S.Chand & Co., 2005.
- 5. Engineering Chemistry with Laboratory Experiments by M. S. Kaurav, PHI Learning Pvt. Ltd., 2011.
- 6. Laboratory Manual on Engineering Chemistry by S. K. Bhasin, and Sudha Rani, Dhanpat Rai &Co., 2006.

#### Note:

1. At least 8 Experiments out of the list shall be performed by the students. Teachers may introduce new experiments for the class in addition to above.

4

Pravi Chamdra

Danar	Code: ES1!	57	Paner:	Enginee	ering Gra	phics-I					L P	C
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Markin 1.	ng Scheme Teacher Term er	: s Contini	uous Eva / Examin	luation: 6	40 marks 0 marks							
	Objective	es.										
1:	The stude scales, d	ents will imension	s and BI	S codes	used wh	ile maki	ng drawi	ngs for v	various s	uipment treams o	used, va of engine	ering
2:	The stude	ents will	learn th	eory of p	rojectio	ns and pr	ojection	of point	S.			
3:	The stud	ents will	learn pr	ojection	of lines	and proje	ection of	planes.				
4:	The stud	ents will	learn th	e project	tion of so	olid and	developn	nent of s	urfaces			
Course	e Outcome	s (CO):										
CO1:	To under	stand the	e theory	of proje	ctions an	d projec	tion of p	oints.				
CO2:	Ability to	do line	projection	ons.			1					
CO3:	Ability to	do plan	e projec	tions.								
CO4:	Ability to	do solic	project	ions and	develop	ment of	surfaces					
Cours	e Outcome	es (CO to	Program	nme Out	comes (	PO) Map	ping (sca	ale 1: lov	w, 2: Me	dium, 3:	High	T 224
CO/P O	P001	PO02		P004	PO05	P006	P007	PO08	PO09	PO10	POTT	PO12
CO1	3	3	3	3	2	-	-		1	2	1	2
CO2	3	3	3	3	2		-	-	1	2	1	2
CO3	3	3	3	3	2	-	-	-	1	2	1	2
					2				4	2	4	2

Unit I

Introduction: Engineering Graphics/Technical Drawing, Introduction to drawing equipments and use of instruments, Conventions in drawing practice. Types of lines and their uses, BIS codes for lines, technical lettering as per BIS codes, Introduction to dimensioning, Types, Concepts of scale drawing, Types of scales Theory of Projections: Theory of projections, Perspective, Orthographic, System of orthographic projection: in reference to quadrants, Projection of Points, Projection in different quadrants, Projection of point on auxiliary planes. Distance between two points, Illustration through simple problems.

#### Unit II

Projection of Lines: Line Parallel to both H.P. and V.P., Parallel to one and inclined to other, Other typical cases: three view projection of straight lines, true length and angle orientation of straight line: rotation method, Trapezoidal method and auxiliary plane method, traces of line.

Unit III

Projection of Planes: Projection of Planes Parallel to one and perpendicular to other, Perpendicular to one and inclined to other, Inclined to both reference planes, Plane oblique to reference planes, traces of planes. Planes Other than the Reference Planes: Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., projections of points and lines lying in the planes, conversion of oblique plane into auxiliary plane and solution of related problems.

Unit IV

Projection of Solids: Projection of solids in first or third quadrant, Axis parallel to one and perpendicular to other, Axis parallel to one inclined to other, Axis inclined to both the principal plane, Axis perpendicular to profile plane and parallel to both H.P. and V.P., Visible and invisible details in the projection, Use of rotation and auxiliary plane method.

Development of Surface: Purpose of development, Parallel line, radial line and triangulation method, Development of prism, cylinder, cone and pyramid surface for both right angled and oblique solids, Development of surface.

Note: The sheets to be created shall be notified by the concerned teacher.

1. Engineering Drawing by N.D. Bhatt, 53rd Ed., Charotar Publishing House Pvt. Ltd

References:

1. Engineering Drawing by P.S. Gill, S.K Kataria & Sons, New Delhi, 2013.

2. Technical Drawing with Engineering Graphics by Frederick E. Giesecke, Shawna Lockhart, Marla Goodman, and Cindy M. Johnson, 15th Ed., Prentice Hall, USA, 2016

3. Engineering Drawing by M.B. Shah and B.C. Rana, 3rd Ed., Pearson Education, New Delhi, 2009

PaperCode: ES1	59 / ES160	Paper: Electrical Sc	ience La	b.	L	Р	С
PaperID: 19915	9 / 199160				-	2	1
Teachers Evaluation:	Continuous	40 marks	*	Term End Examinations:	60 A	Marks	

#### Instructions:

1. The course objectives and course outcomes are identical to that of "Electrical Science" as this is the practical component of the corresponding theory paper.

2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 8 experiments must be performed by the students

1. To Design the circuit for a given load and selection of its various Components and instruments from the safety point of view

OR

To study different types of symbols and standard currently being used in electrical engineering.

2. Study and applications of CRO for measurement of voltage, frequency and phase of signals.

3. Connection of lamp by (1)Single Switch Method. (2) Two-way Switch Method.

OR

Performance comparison of fluorescent Tube & CFL Lamp.

3. To Verify Thevenin's & Norton's Theorem

OR

To Verify Superposition & Reciprocity Theorem.

OR

To Verify Maximum Power Transfer Theorem.

- 4. To Measure Power & Power Factor in a Single-Phase A.C Circuit using Three Ammeters or three Voltmeters.
- 5. To Measure Power & Power Factor in a Balanced Three Phase Circuit using Two Single Phase Wattcmeters.
- 6. To study of Resonance in a series R-L-C or Parallel R-L-C Circuits.
- 7. To perform open circuit and short circuit test on 1-phase transformer.
- 8. Starting, Reversing and speed control of DC shunt Motor
- 9. Starting, Reversing and speed control of 3-phase Induction Motor
- 10. To Study different types of Storage Batteries & its charging system.
- 11. To Study different types of earthing methods including earth leakage circuit breaker (GFCI)

#### Note:

1. At least 8 Experiments out of the list shall be performed by the students. Teachers may introduce new experiments for the class in addition to above.

1

Pravir Chamdra

PaperCode: BS161 /BES162	Paper: Environment	tal Studies Lab.	L P - 2 : 60 Marks	C			
raper code. b31017BE3102			-	2	1		
PaperID: 99161 / 99162		Term End Examinations:	60 A	Marks	100		
Teachers Continue Evaluation:	ous 40 marks	Term cha Examinacions.	60 Marks				

the practical component of the corresponding theory paper.

- 2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 8 experiments must be performed by the students
- Determination of pH, conductivity and turbidity in drinking water sample.
- Determination of pH and conductivity of soil/sludge samples. 2.
- Determination of moisture content of soil sample. 3.
- Determination of Total Dissolved Solids (TDS) of water sample. 4.
- Determination of dissolved oxygen (DO) in the water sample. 5.
- Determination of Biological oxygen demand (BOD) in the water sample.
- Determination of Chemical oxygen demand (COD) in the water sample. 7.
- Determination of Residual Chlorine in the water sample. 8.
- Determination of ammonia in the water sample.
- 10. Determination of carbon dioxide in the water sample.
- 11. Determination of nitrate ions or sulphate ions in water using spectrophotometer.
- 12. Determination of the molecular weight of polystyrene sample using viscometer method.
- 13. Base catalyzed aldol condensation by Green Methodology.
- 14. Acetylation of primary amines using eco-friendly method.
- 15. To determine the concentration of particulate matter in the ambient air using High Volume Sampler.

- 1. For better understanding of various aspects of environment visits to local areas, depending upon easy access and importance may be planned to any nearby river, forest, grassland, hills and students should write a report based on their observations.
- 2. At least 8 Experiments out of the list shall be performed by the students. Teachers may introduce new experiments for the class in addition to above

- 1. Vogel's Text Book of Quantitative Chemical Analysis by G.H. Jefferey, J. Bassett, J. Mendham, and R.C. Denney, Logmaan Scientific & Technical, 1989.
- 2. dst.gov.in/green-chem.pdf (monograph of green chemistry laboratory experiments).
- 3. Essentials of Experimental Engineering Chemistry by S. Chawla, Dhanpat Rai & Co., 2008.
- 4. Experiments in Applied Chemistry by S. Ratan, S.K. KAtaria & Sons, 2003.
- 5. Principles of Environment Science: Enquiry and Applications by W. Cunningham and M. A. Cunningha, Tata McGraw Hill, 2003.
- 6. Perspectives in Environment Studies by A. Kaushik and C. P. Kaushik, New Age Int. (P) Pub., 2013.

Krawin Chamdra

	Code: BS1	Ub	Pape	r: Appli	ed Physic	cs - II		*			L	T/ P	С
	D: 99106							7.0			3		3
1.	g Scheme Teacher Term er	s Contini						0715					
Instruc	tion for p	aper set	ter:		o mama								
2. The and wei	ere should e first uni I the stud ightage of	t will be ents will 15 mark	compuls be requi s.	ory and red to ar	cover the swer any	e entire y THREE	syllabus parts of	. This qu 5 marks	uestion v each. T	his unit v	will hav	eat	ota
stud con 4. The star	art from u rry unit si dent shall tain up to e question ndard / le requirem	hall have be aske 5 sub-pa ns are to vel of the	two quents / sub arts / sub be fraise question	estions empt onlo- questioned kee ens to be	covering y one of ons. Each eping in asked sh	the cor the two Unit sha view the	respondi questio II have a e learnir at the le	ing unit ns in the marks v ng outco vel of th	of the e unit. I weightag omes of he presci	syllabus. Individual ge of 15. the couribed text	. Howel quest	ver, ions oer.	the may
Course	Objective	es:				, cabics ,	uutu (	ubics iii	dy DC 3p	recified if	requii	eu.	
	The sales of the sales of the sales												
1:	To lear	n about t	the quant	tum natu	ire of rea	ality.							
2:	To lear	n about o	the quant quantum	statistic	s and its	ality. significa	nce.						
2: 3:	To lear	n about o erstand t	quantum he struct	statistic ures of c	s and its	significa							
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#### Unit I

Quantum Mechanics: Introduction: Wave particle duality, de Broglie waves, the experiment of Davisson and Germer, electron diffraction, physical interpretation of the wave function, properties, the wave packet, group and phase velocity, the uncertainty principle. The Schrödinger wave equation (1D), Eigen values and Eigen functions, expectation values, simple Eigen value problems - solutions of the Schrödinger's equations for the free particle, the infinite well, the finite well, tunneling effect, the scanning electron microscope, the quantum simple harmonic oscillator (qualitative), zero point energy.

[8Hrs][T1,T2]

#### Unit II

Quantum Statistics: The need for statistics, statistical distributions: Maxwell Boltzmann, Bose-Einstein and Fermi-Dirac statistics, their comparisons, Fermions and Bosons, Applications of quantum statistics: 1. Molecular speed and energies in an ideal gas; 2. The Black body spectrum, the failure of classical statistics to give the correct explanations - Bose-Einstein statistics applied to the Black Body radiation spectrum; Fermi-Dirac distribution, free electron theory, electronic specific heats, Fermi energy and average energy; Dying stars.

[8Hrs][T1,T2]

Crystal Structure: Types of solids, Unit cell, Types of crystals, Translation vectors, Lattice planes, Miller indices, Simple crystal structures, Interplaner spacing, Crystal structure analysis: Bragg's law, Laue method, Point defects: Schottcky and Frankel defects.

[8Hrs][T1,T2]

#### Unit IV

Band Theory of Solids: Origin of energy bands in solids, motion of electrons in a periodic potential - the Kronig-Penny model (Qualitative). Brillouin zones, effective mass, metals, semi-conductors and insulators and their energy band structures. Extrinsic and Intrinsic semiconductors, doping - Fermi energy for doped and undoped semiconductors, the p-n junction (energy band diagrams with Fermi energy), the unbiased diode, forward and reverse biased diodes - tunnel diodes, zener diode, photo diode its characteristics, LED

[8Hrs][T1,T2]

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- Concepts of Modern Physics (SIE) by Arthur Beiser, Shobhit Mahajan, and S. Rai Choudhury, McGraw Hill, Textbooks: 2017.
- Modern Physics by Kenneth S. Krane, Wiley, 2020.

#### References:

- Physics for Scientists and Engineers by Raymond A. Serway and John W. Jewett, 9th Edition, Cengage,
- Principles of Physics by Robert Resnick, Jearl Walker and David Halliday, Wiley, 2015.
- 3. Solid State Electronic Devices , by Streetman and Ben G Prentice Hall India Learning Private Limited;

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	ing Schem		V.									28	
	I. Teach												
2	2. Term e	end Theo	ry Exami	nations:	75 mark	S							
Instru	uction for	paper se	etter:										
1. TI	here shoul	d be 9 qu	uestions	in the te	rm end e	examinat	ions ques	stion pap	er.			-1245	
2. T	he first (	1 <sup>st</sup> ) quest	tion shou	ıld be c	ompulso	ry and c	over the	entire	syllabus.	This que	stion s	hould	d be
01	bjective, s	ingle line	answer	s or shor	t answer	type que	estion of	total 15	marks.				
3. A	part from	question	1 which	is comp	ulsory, re	est of the	e paper s	hall cons	sist of 4	units as p	per the	sylla	bus.
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20	udent sha	n be ask	ed to at	tempt or	nly one o	of the tw	o questi	ons in th	ne unit.	Individua	l quest	ions	may
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5. Th	ne require	ment of	(scientifi	c) calcul	ators / la	og-tables	di ine i	tables a	ne presc	ribed tex	tbook.		
Cours	e Objecti	ves:	Sciencini	c) carcar	4013 / (	og table.	7 data	Lables	nay be s	Jecined 1	requi	ea.	
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CO3:	Ability to	o use Fou	urier and	Laplace	methods	s to solve	formula	ted engi	neering	problems	į.		_
CO4:	Ability to	o solve s	pecific fo	rmulate	d engine	ering pro	blems us	ing PDE	methods				_
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# Unit I

Complex Analysis - I: Complex Numbers and Their Geometric Representation, Polar Form of Complex Numbers. Powers and Roots, Derivative. Analytic Function, Cauchy-Riemann Equations. Laplace's Equation, Exponential Function, Trigonometric and Hyperbolic Functions. Euler's Formula, de'Moivre's theorem (without proof), Logarithm. General Power. Principal Value. Singularities and Zeros. Infinity, Line Integral in the Complex Plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic Functions, Taylor and Maclaurin Series.

# Unit II

Complex Analysis - II: Laurent Series, Residue Integration Method. Residue Integration of Real Integrals, Geometry of Analytic Functions: Conformal Mapping, Linear Fractional Transformations (Möbius Transformations), Special Linear Fractional Transformations, Conformal Mapping by Other Functions, Applications: Electrostatic Fields, Use of Conformal Mapping. Modeling, Heat Problems, Fluid Flow. Poisson's Integral Formula for Potentials

# Unit III

Laplace Transforms: Definitions and existence (without proof), properties, First Shifting Theorem (s-Shifting), Transforms of Derivatives and Integrals and ODEs, Unit Step Function (Heaviside Function). Second Shifting Theorem (t-Shifting), Short Impulses. Dirac's Delta Function. Partial Fractions, Convolution. Integral Equations, Differentiation and Integration of Transforms. Solution of ODEs with Variable Coefficients, Solution of

Systems of ODEs. Inverse Laplace transform and its properties.

Fourier Analysis: Fourier Series, Arbitrary Period. Even and Odd Functions. Half-Range Expansions, Sturm-Liouville Problems. Fourier Integral, Fourier Cosine and Sine Transforms, Fourier Transform. Usage of fourier analysis for solution of ODEs. Inverse Fourier transform and its properties.

[10Hrs]

# Unit IV

Partial Differential Equations (PDEs): Basic Concepts of PDEs. Modeling: Vibrating String, Wave Equation. Solution by Separating Variables. Use of Fourier Series. D'Alembert's Solution of the Wave Equation.

Characteristics. Modeling: Heat Flow from a Body in Space. Heat Equation: Solution by Fourier Series. Steady Two-Dimensional Heat Problems. Dirichlet Problem. Heat Equation: Modeling Very Long Bars. Solution by

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Fourier Integrals and Transforms. Modeling: Membrane, Two-Dimensional Wave Equation. Rectangular Membrane. Laplacian in Polar Coordinates. Circular Membrane. Laplace's Equation in Cylindrical and Spherical Coordinates. Potential. Solution of PDEs by Laplace Transforms. [10Hrs]

# Textbooks:

1. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley, 10th Ed., 2011.

# References:

- 1. Engineering Mathematics by K.A. Stroud with Dexter J. Booth, Macmillan, 2020.
- 2. Advanced Engineering Mathematics by Larry Turyn, Taylor and Francis, 2014.
- 3. Advanced Engineering Mathematics by Dennis G. Zill, Jones & Bartlett Learning, 2018.
- 4. Advanced Engineering Mathematics with MATLAB by Dean G. Duffy, Taylor and Francis, 2017.
- 5. Advanced Engineering Mathematics by Merle C. Potter, Jack L. Lessing, and Edward F. Aboufadel, Springer (Switzerland), 2019.
- 6. Mathematical Methods for Physics and Engineering, by K. F. Riley, M. P. Hobson and S. J. Bence, CUP,

Brawn Chamdra

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	ng Schem												
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2	. Term e	nd Theo	ry Exami	nations:	75 marks	5		manual - L					
	ction for												
1. Th	nere shoul	d be 9 qı	estions :	in the te	rm end e	xaminat	ions ques	tion pap	er.				
2. TI	he first (1	") quest	ion shou	ıld be co	ompulsor	y and co	over the	entire s	yllabus.	This que	estion	shoul	d be
ob	ojective, s	ingle line	answer	s or shor	t answer	type que	estion of	total 15	marks.				
3. Ap	part from	question	1 which	is compl	ulsory, re	est of the	e paper s	hall cons	sist of 4	units as p	per th	e sylla	abus.
Ev	ery unit	shall hav	re two o	questions	coverin	g the co	orrespon	ding uni	t of the	syllabus	. Hov	vever	the
sti	udent sha	ll be ask	ed to at	tempt or	nly one o	of the tw	o questi	ons in th	ne unit.	Individua	l que	stions	may
CO	ontain upto	5 sub-p	arts / su	b-questi	ons. Each	Unit sh	all have a	a marks v	weightag	e of 15.			
4. Th	he questio	ons are t	o de fra	med kee	eping in	view th	e learnir	ng outco	mes of t	the cours	se / p	aper.	The
Sta	andard / l	evel of the	ne quest	ions to b	e asked s	should be	at the l	evel of t	he presc	ribed tex	tbook	(.	
5. Th	ne requirer e Objectiv	nent or t	scientiii	c) calcul	ators / to	og-tables	/ data -	tables	nay be sp	pecified i	if requ	iired.	
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	systems.	rt knowl	eage to	solve pr	obtems t	pertainin	g to force	e syster	ns, equil	ibrium a	nd di	stribu	ted
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3:	To impa	rt knowle	edge to s	looke pro	the arel	Triction	and engi	neering	trusses.				
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	e Outcom	rt knowle	eage to t	leat with	the prot	otems of	kinemat	ics and k	inetics o	f rigid bo	dies.		
CO1:	***************************************		rahlama				217						
CO2:	Ability to	solve p	roblems	pertainir	ig to force	e systen	ns, equiti	ibrium ar	na distrib	outed sys	tems.		
CO3:	Ability to	o doal wi	th the n	or metic	on and en	igineerin	g trusses						
CO4:	Ability to	deal wi	th the pi	roblems	of kinem	atics and	kinetics	of parti	cle				
Charles and the Control of the Contr	Outson	deal wi	th the pi	roblems	of kinem	atics and	kinetics	of rigid	bodies.				
CO/P	PO01	PO03	o Progra	mme Ot									
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CO1	3	3	2	2	2							-	_
02	3	3	3	3	2	-	-	-	1	1	1		2
	3	3	3	3		-	-	-	1	1	1		2
CO3 CO4	3	3		3	2		-	-	1	1	1		2
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# Unit I

Force System: Introduction, force, principle of transmissibility of force, resultant of a force system, resolution of a force, moment of force about a line, Varigon's theorem, couple, resolution of force into force and a couple, properties of couple and their application to engineering problems.

Equilibrium: Force body diagram, equations of equilibrium and their applications to engineering problems, equilibrium of two force and three force members.

Distributed Forces: Determination of center of gravity, center of mass and centroid by direct integration and by the method of composite bodies, mass moment of inertia and area moment of inertia by direct integration and composite bodies method, radius of gyration, parallel axis theorem, polar moment of inertial.

[10Hrs]

# Unit II

Structure: Plane truss, perfect and imperfect truss, assumption in the truss analysis, analysis of perfect plane trusses by the method of joints, method of section and graphical method.

Friction: Static and Kinetic friction, laws of dry friction, co-efficient of friction, angle of friction, angle of repose, cone of friction, frictional lock, friction in flat pivot and collar bearing, friction in flat belts. [10Hrs]

# Unit III

Kinematics of Particles: Rectilinear motion, plane curvilinear motion, rectangular coordinates, normal and tangential coordinates.

Kinetics of Particles: Equation of motion, rectilinear motion and curvilinear motion, work-energy equation, conservation of energy, concept of impulse and momentum, conservation of momentum, impact of bodies, coefficient of restitution, loss of energy during impact.

[10Hrs]

# Unit IV

Kinematics of Rigid Bodies: Concept of rigid body, types of rigid body motion, absolute motion, introduction to relative velocity, relative acceleration (Corioli's component excluded) and instantaneous center of zero velocity, Velocity and acceleration.

Kinetics of Rigid Bodies: Equation of motion, translatory motion and fixed axis rotation, application of work energy principles to rigid bodies conservation of energy.

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Approved by AC sub-committee: 22/11/2021

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Beam: Introduction, types of loading, methods for the reactions of a beam, space diagram, types of end supports, beams subjected to couple. [10Hrs]

# Textbooks:

1. Engineering Mechanics by A.K.Tayal, Umesh Publications.

# References:

- 1. Engineering Mechanics by K. L. Kumar, Tata Mc-Graw Hill
- 2. 'Engineering Mechanics' by S. Timoshenko, D. H. Young, J. V. Rao, Tata Mc-Graw Hill
- 3. 'Engineering Mechanics-Statics and Dynamics' by Irwing H. Shames, PHI.
- 4. 'Engineering Mechanics' by Basudev Bhattacharya, Oxford University Press.

Vorani Chamdra

Pap	perCode: BS152	Paper:	Applied Physics - II	Lab.	L	P	С
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	achers Iluation:	Continuous	40 marks	Term End Examinations:	60 /	Marks	
Inst	tructions:						
1.	The course object practical components	tives and cou	urse outcomes are ideresponding theory p	dentical to that of (Applied Physics paper.	- I) as	this i	s the
2.	The practical list	shall be not	ified by the teacher	in the first week of the class comment / Institution in which the pape	nencer	ment u	inder fered

- 1. To determine the e/m ratio of an electron by J.J. Thomson method.
- 2. To measure the frequency of a sine-wave voltage obtained from signal generator and to obtain lissajous pattern on the CRO screen by feeding two sine wave signals from two signal generators.

from the list of practicals below. Atleast 8 experiments must be performed by the students

- 3. To determine the frequency of A.C. mains by using Sonometer.
- 4. To determine the frequency of electrically maintained tuning fork by Melde's method.
- 5. Computer simulation (simple application of Monte Carlo): Brownian motion, charging & discharging of a capacitor.
- 6. To study the charging and discharging of a capacitor and to find out the time constant.
- 7. To study the Hall effect.
- 8. To verify Stefan's law.
- To determine the energy band gap of a semiconductor by four probe method/or by measuring the variation of reverse saturation current with temperature.
- 10. To study the I-V characteristics of Zener diode.
- 11. To find the thermal conductivity of a poor conductor by Lee's disk method.
- 12. To study the thermo emf using thermocouple and resistance using Pt. Resistance thermometer.

Note: Teacher's may use the prescribed books to choose the practicals in addition to above. Total 8 practicals minimum shall be performed by the students, they may be asked to do more. Atleast 4 experiments must be from the above list.

## Textbook:

- 1. B.Sc. Practical Physics by C. L. Arora, S.Chand & Co., 2020.
- 2. Practical physics by R. K. Shukla and A. Srivastava, New Age Int. (P) Ltd., 2006.

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Prair Chambra

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Course	Objective	es:										
1:	The stud	ents will	learn sec	ctioning	of solid t	igures.			12	- f :	ric and	
2:	The stud oblique p	rojection	ns.						canding	or isomet	,i ic and	
3:	The stud	ents will	have und	derstand	ing of pe	rspectiv	e projec	tions,				
4:	The stud	ents will	learn co	mputer a	aided dra	afting.						
Course	Outcome	s (CO):										
CO1:	Ability to	draw se	ctional d	liagrams	of solids	5						
CO2:	Ability to	draw 35	project	ions (iso	metric a	nd obliq	ue).					
CO3:	Ability to	draw pe	erspectiv	e projec	tions.							
CO4:	Understa	ind and u	se a CAD	tool (A	utoCAD).				2.11	- di	. Uigh	
Course	e Outcome	s (CO to	Program	nme Out	comes (	PO) Map	ping (sc	ale 1: lo	w, Z: M	posto	PO11	PO12
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CO1	3	3	3	3	2	1.41		-	1	2	1	2
CO2	3	3	3	3	2	-	70	-	1	2	1	2
CO3	3	3	3	3	2	-	1.53	-	1 -	2	1	2
CO4	3	3	3	3	2	-	-	2	1	2	1	2

Section of Solids: Definition of Sectioning and its purpose, Procedure of Sectioning, Illustration through examples, Types of sectional planes-application to few examples.

Isometric Projection: Classification of pictorial views, Basic Principle of Isometric projection, Difference between isometric projection and drawing, Isometric projection of solids such as cube, prism, pyramid and cylinder.

Oblique Projection: Principle of oblique projection, difference between oblique projection and isometric projection, receding lines and receding angles, oblique drawing of circle, cylinder, prism and pyramid.

Perspective Projection: Principle of perspective projection, definitions of perspective elements, visual ray method, vanishing point method. Conversion of 3D to 2D figures.

# Unit IV

Introduction to CADD: Interfacing and Introduction to CAD Software, Coordinate System, 2D drafting: lines, circles, arc, polygon, etc., Dimensioning, 2-D Modelling, Use of CAD Software for engineering drawing practices.

Note: The sheets to be created shall be notified by the concerned teacher.

# Textbooks:

1. Engineering Drawing by N.D. Bhatt, 53rd Ed., Charotar Publishing House Pvt. Ltd., Gujarat, 2017.

# References:

1. Engineering Drawing by P.S. Gill, S.K Kataria & Sons, New Delhi, 2013.

2. Technical Drawing with Engineering Graphics by Frederick E. Giesecke, Shawna Lockhart, Marla Goodman, and Cindy M. Johnson, 15th Ed., Prentice Hall, USA, 2016

3. Engineering Drawing by M.B. Shah and B.C. Rana, 3rd Ed., Pearson Education, New Delhi, 2009.

4. AutoCAD 2017 for Engineers & Designers by Sham Tickoo,, Dreamtech Press 2016.

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	e Objectiv											
1:	The stud	lents will	l learn ba	asics of s	afety pre	ecautions	to be ta	aken in la	ab. / wor	kshop		
2:	The stud	ents will	l have an ese mach	overvie	w of diffe	erent ma	chines u	sed in wo	orkshop a	and the o	perati	ons
3:	The stud	ents will	l have un	derstand	ing of va	rious we	lding pro	ocesses.				
4:	The stud	ents will	have un	derstand	ding of sh	eet met	als hop a	nd fittin	g shop			
Course	e Outcom								3			
CO1:			work in a	Lab./wo	orkshop.							
CO2:			chines (l			r. planer	. grinder	drill).				
CO3:	Ability to					, ,	, 5	,				
CO4:	Ability to	use she	et metal	tools an	d fitting	shop too	ols.					
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CO2	2	1	2	2	3	1	-	_			-	2
CO3	2	1	2	2	3	1	-	_	-	_		2
	2		2	2	3							-

# Unit I

Safety, precautions and maintenance: Safety in shop, safety devices, safety and precautions - moving machine and equipment parts, electrical parts and connections, fire, various driving systems like chain, belt and ropes, electrical accidents, an overview of predictive, preventive and scheduled maintenance, standard guidelines to be followed in shop.

# Unit II

Introduction to machine shop: Introduction to Lathe, Milling, shaper, Planer, grinder, drilling and overview of operations performed on these machines by making some jobs.

# Unit III

Introduction to welding shop: Welding, types of welding, tools and applications, gas welding and arc welding, edge preparation, various joints formation by gas welding and electric arc welding.

# Unit IV

Introduction to sheet metal shop: Sheet metal tools and operations, formation of a box using sheet. Introduction to fitting shop: Introduction to fitting, tools and applications, some jobs in fitting shop.

# Textbooks:

1. Workshop Technology Vol. 1 and Vol. 2, Hajra Choudhary and Roy, Media Promoters and Publishers, 2018.

# References:

- 1. A course in Workshop Technology Vol. 1 and Vol. 2, B. S. Raghuvanshi, Dhanpat Rai and Compnay, 2015.
- 2. Workshop Technology (Manufacturing Processes), Khurmi and Gupta, S. Chand Publication, 2010.

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Pravi Chambra

# SCHEME FRAMEWORK FOR 2<sup>nd</sup> to 4<sup>th</sup> year

		Third Semester			C 114-
Group	Paper Code	Paper	L	Р	Credits
Theory Par	pers		4		4
ES/BS		Computational Methods	4		16
PC		Programme Core Theory Papers	16	-	2
HS/MS	t	Elements of Indian History for Engineers	Z	-	L
Practical/V	iva Voce		-	2	1
ES/BS	/ NO. NO. 10 10 10 10 10 10 10 10 10 10 10 10 10	Computational Methods Lab.	-	2	3
PC		Programme Core Lab. Papers	-	6	
Total			22	8	26
Total		Fourth Semester			1 - 11:
Group	Paper Code	Paper	L	Р	Credits
Theory Pa	pers				1
ES/BS	- Charles (Par	Probability, Statistics and Linear Programming	4	-	16
PC		Programme Core Theory Papers	16	-	2
HS/MS		Technical Writing	2	-	Z
Practical/	Viva Voce				1
ES?BS		Probability, Statistics and Linear Programming Lab.	•	2	1
PC		Programme Core Lab. Papers	-	6	3
Total		1.05	22	8	26
Total		Fifth Semester			
Group	Paper Code	Paper	L	P	Credit
Theory Pa	apers		1 20	_	20
PC		Programme Core Theory Papers	20	-	20
HS/MS		Economics for Engineers	2		
	Viva Voce			,	7
PC		Programme Core Lab. Papers	7/	6	3
PC / Internship		Summer Training (after 4th semester) Report *			
		sive evaluation by the a committee of teachers, con	22	6	26

<sup>\*</sup>NUES: Comprehensive evaluation by the a committee of teachers, constituted by the Academic Programme Committee, out of 100. The training shall be of 4 to 6 weeks duration. The training can be under the mentorship of a teacher of the institution.

Prawin Chamdra

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		Sixth Semester	15		
Group	Paper Code	Paper	L	P	Credits
Theory P	apers				
PC		Programme Core Elective Papers			12
EAE / PAE		Emerging Area / Open Area Elective Papers			8
HS/MS		Principles of Management for Engineers	4		4
Practical/	Viva Voce	3			
HS		*NSS / NCC / Cultural clubs / Technical Society / Technical club*			2
Total					26

Note: The elective papers can be (a) Only Theory: In this case, the teachers continuous evaluation shall be of 25 marks, while the term end examinations shall be of 75 marks, (b) The elective paper may have Theory and practical components, in this case the Theory Credits shall be of 3 credits while the practical component shall be of 1 credit. The Teachers Continuous Evaluation Component for the complete paper (inclusive of Theory and Practical Component) shall be 25 Marks, The Term End Semester Examination for Theory Component shall be of 50 Marks, while the Term End Semester Component for Practical shall be of 25 marks. The marksheet of results for the students shall reflect all components of marks.

\*NUES: Comprehensive evaluation of the students by the concerned coordinator of NCC / NSS / Cultural Clubs / Technical Society / Technical Clubs, out of 100 as per the evaluation schemes worked out by these activity societies, organizations; the co-ordinators shall be responsible for the evaluation of the same. These activities shall start from the 1st semester and the evaluation shall be conducted at the end of the 6st semester for students admitted in the first semester. Students admitted in the 2st year (3st semester) as lateral entry shall be for the period of 3st semester to 6st semester only.

		Seventh Semester			
Group	Paper Code	Paper	L	Р	Credits
Theory P	apers				
PC		Programme Core Elective Papers			8
EAE /		Emerging Area / Open Area Elective Papers			12
HS/MS		Principles Entrepreneurship Mindset	2		2
Practical.	/Viva Voce				
PC / Project		Minor Project**			3
PC / Internship		Summer Training (after 6th semester) Report *	-	-	1
Total					26

Note: The elective papers can be (a) Only Theory: In this case, the teachers continuous evaluation shall be of 25 marks, while the term end examinations shall be of 75 marks, (b) The elective paper may have Theory and practical components, in this case the Theory Credits shall be of 3 credits while the practical component shall be of 1 credit. The Teachers Continuous Evaluation Component for the complete paper (inclusive of Theory and Practical Component) shall be 25 Marks, The Term End Semester Examination for Theory Component shall be of 50 Marks, while the Term End Semester Component for Practical shall be of 25 marks. The marksheet of results for the students shall reflect all components of marks.

\*NUES: Comprehensive evaluation by the a committee of teachers, constituted by the Academic Programme Committee, out of 100. The training shall be of 4 to 6 weeks duration. The training can be under the mentorship of a teacher of the institution.

\*\* The student shall be allocated a supervisor / guide for project work at the end of 6th semester by the department / institution, the project shall continue into the 8th semester. In the 7th semester evaluation, the criteria for evaluation shall be conceptualization of the project work, the background study / literature survey and identification of objectives and methodology to be followed for project. 40 marks evaluation for the Teachers' Continuous Evaluation / Internal Assessment shall be done by the concerned supervisor while the term end examinations of 60 marks shall be conducted by the supervisor concerned and the external examiner deputed by the Examinations Division. In the absence of the supervisor, the Director of the Institution / Head of Department can assign the responsibility of the supervisor (for purpose of examinations) to any faculty of the Institution / Department.

		Eight Semester	1	T/P	Credits
Group	Paper Code	Paper	_	17F	Credits
Practical/Viv	a Voce/Int	ernship*			144
PC / Project	ES452	Major Project - Dissertation "			14
1011101==	ES454	Major Project Viva Voce®			4
	ES456	Project Progress Evaluation*			2
PC /	ES458	Internship Report#			14
Internship	ES460	Internship Viva Voce#			4
internsinp	ES462	Internship Progress Evaluation**			2
Total	LJ40Z	micerinaria g.			20

\*NUES: Comprehensive evaluation by the a committee of teachers, constituted by the Academic Programme Committee, out of 100.

% By default every student shall do the project work (ES452, ES454, and ES456). A student shall either be allowed to do a project work (ES52, ES454, and ES456) or an internship (ES458, ES460, and ES462). The student must apply for approval to do internship before the commencement of the 8th semester to the school, and only after approval of Head of Department through Training and Placement Officer of the Department, shall proceed for internship.

\*\* The student offered project work shall be allocated a supervisor / guide for project work at the

end of 6th semester by the School, the project shall continue into the 8th semester.

# Students may be allowed to do internship in this semester in lieu of Major project. The students allowed to proceed for internship shall be required to maintain a log-book of activities performed during internship. The same has to be countersigned by the mentor at the organization where internship is completed.

ES452: Evaluation shall be conducted of 40 marks (Teachers' continuous evaluation / internal assessment) by the supervisor. And, 60 marks by an external examiner deputed by examinations

division (COE), for a total of 100 marks.

ES454: Evaluation shall be conducted of 40 marks (Teachers' continuous evaluation / internal assessment) by the supervisor. And, 60 marks by a bench of the supervisor and the external examiner deputed by examinations division (COE), for a total of 100 marks.

ES456/ES462: Comprehensive evaluation by the a committee of teachers, constituted by the

Academic Programme Committee, out of 100.

ES458/ES460: Evaluation shall be conducted of 40 marks (Teachers' continuous evaluation / internal assessment) by the training and placement officer of the department on the basis of the report submitted by the student. And, 60 marks by a bench of the Training and Placement Officer of the department and the external examiner deputed by examinations division (COE), for a total of 100 marks.

In the absence of the supervisor or the Training and placement officer (as the case may be), the head of department can assign the responsibility of the supervisor or the Training and Placement officer (for purpose of examinations) to any faculty of the department.

Note: Codes are given as example only in Framework for Schemes of 2<sup>nd</sup> to 4<sup>th</sup> year. Actual codes shall be assigned when the final schemes are made.

Note on Elective Papers: The elective papers shall be allowed to be taken / studied by the students, by the APC of the School, keeping in view that two papers studied by the student should not have a substantial overlap. All papers studied by the student should be substantially distinct to content.

Note on Examination of Elective Papers:

(a) Papers with only theory component shall have 25 marks continuous evaluation by the teacher and 75 marks term-end examinations. Both these component marks shall be reflected on the marksheet of the student.

(b) Papers with only practical component shall have 40 marks continuous evaluation by the teacher and 60 marks term-end examinations. Both these component marks shall be reflected on the marksheet of the student.

(c) Papers with both theory and practical components shall have 25 marks continuous evaluation by the teacher and 25 marks term-end examinations for practical and 50 marks term end examination for the theory component. All three component marks shall be reflected on the marksheet of the student.

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Pravi Chandre

# Implementation Rules:

- 1. The examinations, attendance criteria to appear in examinations, promotion and award of the degree shall be governed by the Ordinance 11 of the University. The term "major discipline" / "primary discipline" in this document refers to the discipline in which student is admitted / studies from 3<sup>rd</sup> semester onwards. However credits of courses / paper for OAE / EAE groups shall not be considered for the purpose of promotion from one year of study to the subsequent year of study.
- 2. Minimum duration of the Bachelor of Technology programme shall be 4 years (N=4 years) (8 semesters).
- 3. Maximum duration of the Bachelor of Technology programme shall be 6 years (N+2 years). After completion of N+2 years of study, if the student has appeared in the papers of all the semesters upto 8th semester, then a maximum extension of 1 year may be given to the student for completing the requirements of the degree if and only if the number of credits already earned by the student is atleast 150 (for lateral entry students it shall be at least 102 credits) from the (non-honours components). Otherwise, the admission of the student shall stand cancelled. After the period of allowed study, the admission of the student shall be cancelled.
- 4. The degree shall be awarded only after the fulfilment of all requirements of the scheme and syllabus of Examinations.
- 5. The scheme and syllabi of the Master of Technology part of the Bachelor / Master of Technology (Dual Degree) shall be notified separately. This document pertains to the Bachelor of Technology part of the Bachelor / Master of Technology (Dual Degree) programme only.
- 6. The students shall undergo the following group of Courses / Papers as enumerated in the scheme.

		Se	emester	(Credi	ts)			Total	Mandatory
Group	1 & II	III	IV	٧	VI	VII	VIII	Credits	Credits
BS	24	5	5					34	18
HS	6	2	2	2	6	2		20	10
ES	20							20	16
PC		19	19	24		4	20	86	76
PCE					12	8		20	16
EAE/OA					8	12		20	16
Total	50	26	26	26	26	26	20	200	150

TABLE 1: Distribution of Credits.

- 7. Mandatory Credits specify the number of credits from each subject group to be mandatorily acquired by the student for the award of the degree. See clause 12 and 13 also.
- 8. Some of the papers are droppable in the sense that the student may qualify for the award of the degree even when the student has not cleared / passed some of the papers of these group. However, the student has to earn the minimum credits for the programme of study as specified. See clause 12 and 13 also.
- 9. The open electives of the OAE group of courses may be taken through SWAYAM / NPTEL MOOCs platform. The student desirous of doing a MOOC based course among the OAE group must seek approval of the APC of the institution for the same before the commencement of the semester. The

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APC shall allow the MOOC based OAE option to the student if and only if the MOOC subject / course being considered for the student is being offered in line with the Academic Calendar applicable. The student shall submit the successful completion certificate with marks to the institution for onwards transfer to the Examination Division. The Examinations Divisions shall take these marks on record for incorporation in the result of the appropriate semester. These marks / grades of these courses shall be used for calculation of the SGPA/CGPA of the student concerned by the examination division of the University. If a student takes even one OAE paper through MOOCs, then the student shall not be eligible for minor specialization. The degree to the student on fulfilment of other requirements for such cases shall be through clause 13.b. or 13.c.

These MOOC courses taken by the students, if allowed by the APC of the institution shall be of 4 credits or more collectively to be against or for one paper slot in the scheme, through MOOCs, though the marks shall be shown individually. That is in one paper slot in the scheme wherever a MOOC course is allowed, the student may register for more than one paper to aggregate 4 credits or more. If the credits of these MOOC Courses, allowed to a student is more than 4, then the maximum credit for the programme shall be amended accordingly for the particular student. Also, in a particular semester, a student may take more than one MOOC course with the approval of the APC to meet the credit requirements of OAE for the semester. The cost of taking the MOOC course is to be borne by the concerned student. The results of the MOOC courses shall be declared separately by the examination division from the result for the papers conducted by the examination division of the University.

The student opts for emerging area electives in this group also, the same shall be allowed subject to other conditions specified in the rules / scheme.

10. To earn an Honours degree, the student may enrol for 20 credits or more through SWAYAM / NPTEL MOOCs platform. This point has to be read together with other points specially point 13 and 14, The acquisition of the credits should be completed before the 15th of the July of the admission year plus 4 years. That is, if a student is admitted in the year X, then these credits must be acquired through MOOCs by 15th July of the year (X+4), no extra duration or time shall be allocated.

Honours in the degree shall be awarded if and only if at least 20 credits are acquired through MOOCs. To obtain Honours in the programme, the student must apply to the instution about the same before the commencement of the 5th semester. The specific courses through MOOCs shall be registered by the student only after approval by the Academic Programme Committee (APC) of the Institution. The APC shall approve the course if it is not already studied by the student or the student shall not study it in future and adds value to the major area of specialization (which is the degree). The papers for which the student desires to appear for Honours through MOOCs, all papers results shall be submitted by the student to the Institution for onwards transfer to Examination Division of the University, to be taken on record of the University. The results of these papers shall be a part of the records of the examinations of the students. The records shall be submitted by the student to the Institution, then transferred to the Examinations division, shall be notified by the examinations division of the University, and a separate marksheet shall be issued by the Examinations divisions. The cost of taking the MOOC course is to be borne by the concerned student. Such courses shall be reflected as additional courses / papers for the student.

If a student acquires less than 20 credits through MOOCs, following the mechanism specified, then also the results of these papers shall be taken on record as specified above, though no Honours degree shall be awarded.

The papers through MOOCs for Honours degree shall not be a part of the set of the papers over which the SGPA / CGPA of the student shall be calculated.

The papers through MOOCs for Honours degree shall be additional papers studied by the students and are to be taken into account only for award of Honours in the degree programme, if 20 credits are earned through MOOCs as approved by APC, by a student. See Clause 14 also.

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- 11. Maximum Credits: at least 184 (Table 1), these are the credits for which the student shall have to study for the non-Honours component of the curriculum. The student has to appear in the examinations for these credits.
- 12. Minimum Credits: 184 (out of the 200 non Honours papers credits). See clause 7 also.

13. The following degree route can be taken by a student (also refer point 14):

- The students shall be awarded one minor specializations, one from EAE/OEA route under the following conditions:
  - i. The student has earned The student has earned the mandatory credits as defined in Table 1 and clause 7.
  - ii. The student earns 20 credits from one group of EAE / OAE courses offered as a minor specialization by the institution..
  - iii. In addition, the total credits (including the above specified credits) earned by the student is atleast 184 credits.

The degree nomenclature of the degree shall be as: "Bachelor of Technology (Primary Discipline) with minor specializations in <concerned EAE/OAE discipline>)"; if criteria / point 10 is not satisfied for Honours. Otherwise, if criteria / point 10 is met, then the degrees shall be an Honours degree and the nomenclature shall be as: "Bachelor of Technology (Primary Discipline) with minor specializations in <concerned EAE/OAE discipline>) (Honours)", if in addition to point 13.a.i, 13.a.ii, and 13.a.iii, the student fulfils the criteria for Honours as specified at point 10.

- The students shall be awarded the a degree without any minor specialization under the following conditions:
  - i. The student has earned The student has earned the mandatory credits as defined in Table 1 and clause 7.
  - ii. In addition, the total credits (including the above specified credits) earned by the student is atleast 184 credits.

The degree nomenclature of the degree shall be as: "Bachelor of Technology (Major Discipline)"; if criteria / point 6 is not satisfied for Honours. Otherwise, if criteria / point 10 is met, then the degrees shall be an Honours degree and the nomenclature shall be as: "Bachelor of Technology (Major Discipline) (Honours)", if in addition to point 13.b.i and 13.b.ii, the student fulfils the criteria for Honours as specified at point 10.

If the student does not fulfil any of the above criterions (point 13.a, or 13.b), if the student earns at least 188 credits out of 200 credits as enumerated in Table 1 (disregarding the mandatory credits clause of Table 1 and Clause 7), then the student shall be award the degree as Bachelor of Technology (Primary Discipline). Such students shall not be eligible for the award of an Honours degree. Though if credits are accumulated through MOOCs as per clause 10, the same shall be reflected in the marksheets of the students.

14. The Honours degree shall only be awarded if the CGPA of the student is above or equal to 7.5 in addition to fulfilment of criteria / point 10 and 13 above and the degree is awarded after the immediate completion of the 4th of the batch from the year of admission. No Honours shall be conferred if the degree requirements are not completed in the minimum duration.

15. Pass marks in every paper shall be 40.

16. Grading System shall be as per Ordinance 11 of the University.

17. The programme core electives (PCE) shall be specific to a major discipline, minor specializations and papers for EAE shall be defined by the school defining the syllabus for the particular areas and minor specializations and papers for OAE shall be defined by the schools defining the elective streams. The institution shall offer atleast two elective groups for students of each major discipline. The emerging area / open electives can also be offered as standalone papers not forming a part of any elective groups also. The prerequisites for a specific paper, shall be

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defined in the detailed scheme and syllabus document. The institution shall decide the group(s) and/or individual papers to be offered as electives based on the availability of infrastructure and faculty. From the groups / papers offered by the institution, an elective paper / group shall be taught if and only if the number of students in a paper is at-least 20 or at-least 1/3 of the students of a major discipline for which the paper / group is to be offered. The APC of the department / institution may define a maximum number of students allowed to register for a paper as an elective (EAE / OAE).

- 18. Teachers of other department, as and when deputed by their department, for teaching the students enrolled in programmes offered by the department offering the programme shall be a part of the Academic Programme Committee of the discipline. Such teachers, for all academic matters, including teaching, teachers' continuous evaluation, term end examinations etc. shall be governed by the decisions of the APC of department offering the programme of study. Similarly, the guest faculty, the visiting faculty and the contract / Ad Hoc faculty as and when deputed to teach students of a particular department shall form a part of APC of the department.
- 19. The medium of instructions shall be English.

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Poranie Chamdra

# Assessment of Outcomes Achieved in a Course / Paper. That is, Learning Outcome Assessment Alignment Grid.

Learning Outcome	Course/Project	How Learning Will Be Assessed	Resources	Attainment Level
***************************************				

To complete the alignment grid, start by listing one learning outcome per row beneath the "Learning Outcome" column. Make sure that each learning outcome can be assessed by a single method.

Next, beneath the "Course/ Project" column, list the course(s) or project(s) or assignments or tests that students will complete in order to achieve the learning outcome.

In the "How Learning Will Be Assessed" column, list the assessment(s) tool that will be used for that particular learning outcome. It is fine for there to be more than one assessment used for a particular outcome, so long as each assessment captures the outcome in its entirety. Likewise, it is fine for a single assessment to be used for multiple outcomes.

In the column entitled "Resources", list any additional materials, technologies, or resources needed for students to meet the learning outcome.

In the column entitled "Attainment Level", list in a quantifiable manner the average attainment level.

Every teacher must make this sheet for every paper taught. Be that a paper with only theory component, only practical component or with both theory and practical component.

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