NEP 2020 Structure

Semester wise Indicative Credit Distribution

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course	BSC/ESC	06-08	10-12		--	--	--	--	--	16-20
Engineering Science Course		11-12	04-05		--	--	--	--	--	15-17
Programme Core Course (PCC)	Programme Courses	--	02	07-09	16-18	14-16	08-10	--	--	49-57
Programme Elective Course (PEC)		--	--	--	--	03-04	10-12	08 - 10	08-09	29-35
Open Elective (OE) Other than particular programme	Multidisciplinary	--	--	04	03	03	--	--	--	10
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	--	02	--	02	--	02	--	--	06
Ability Enhancement Course (AEC -01)	Humanities Social Science and Management	03	--	--	--	--	--	--	--	03
Modern Indian Language (AEC-02)		--	--	04	--	--	--	--	--	04
Indian Knowledge System (IKS)			02		--	--	--	--	--	02
HSSM: Value Education Course (VEC)		--	--	04	--	--	--	--	--	04
Internship	Experiential Learning Courses	--	--	--	--	--	--	08	--	08
Project		--	--	--	--	--	--	04	04	08
Community Engagement Activity (CEA)/Field										
Project		--	---	02	--	--	--	--	--	02
Co-curricular & Extracurricular Activities (CCA)	Liberal Learning Course	--	02	02	--	--	--	--	02	06
Total Credits (Major)		20-23	22-25	23-25	21-22	20-23	20-24	20-22	14-15	160-166

Notes:

1. Students who are earning a minimum total 160 credits (also minimum from each course category) will be offered a major degree from the respective programme only. These candidates have the following additional options.

    a) Single Minor (Interdisciplinary or Multidisciplinary) OR Major with Honor's OR Major by Research with additional credits = 18-22 (Minimum credit required 18)

    b) Double Minor (Interdisciplinary or Multidisciplinary) OR Major with Honor's OR Major by Research with further additional credits = 18-22 (Minimum credit required 18)

    c) Value added courses over and above listed for minimum credits: as per his/her choice and no restriction to numbers.

2. Institute can also offer additional few (3-5) Mandatory Non-Credit courses as Value added courses.
3. Internship of six months shall be offered either in VII or VIII semester. Courses during Internship period shall be offered in online modes.
4. Additional credits (06-08) in the form of skill-based courses, internship, mini projects shall be offered in 8 weeks' vacation period after every year for exit options.

Semester	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total Credits**
Credits for Single Minor/ Honor's / Research	**---**	**---**	**---**	**03**	**03**	**04**	**04**	**04**	**18**
Total Credits (Major + Single Minor/ Honor's / Research)	**20-23**	**22-25**	**23-25**	**24-25**	**23-26**	**24-28**	**24-26**	**18-19**	**178-182**
Additional Credits for Double- Minor/ Honor's / Research	**---**	**---**	**---**	**03**	**03**	**04**	**04**	**04**	**18**
Total Credits (Major +Double Minor/ Honor's / Research)	**20-23**	**22-25**	**23-25**	**27-28**	**26-29**	**28-32**	**28-30**	**22-23**	**198-200**

The proposed scheme is indicative, Institutes and Universities may make minor variations keeping AICTE / NEP 2020 guidelines.

Proposed Structure for Electronics and Telecommunication Engineering

First Year

	Course Code	Course Title	L	T	P	Cr	Categorisation
SEM- I	BSC-01	Engineering Physics	3	0	0	3	BSC
	BSCL-01	Engineering Physics Lab	0	0	2	1	BSC
	BSC-02	Engineering Mathematics-I	3	1	0	4	BSC
	ESC-01	Basic Electrical & Electronics Engineering	2	1	0	3	ESC
	ESCL-01	Basic Electrical & Electronics Engineering Lab	0	0	2	1	ESC
	ESC-02	Engineering Graphics and Design	2	0	0	2	ESC
	ESCL-02	Engineering Graphics and Design Lab	0	0	2	1	ESC
	AEC-01	Communication Skill	2	0	0	2	AEC/VEC/IKS
	AECL-01	Communication Skill Lab	0	0	2	1	AEC/VEC/IKS
	VSEC-01	Design Thinking	2	0	0	2	VSEC
	CC-01	NSS/NCC/Yoga Education	1	0	2	2	CC
		Total	**14**	**2**	**10**	**21**	
SEM- II	BSC-03	Engineering Chemistry	3	0	0	3	BSC
	BSCL-03	Engineering Chemistry Lab	0	0	2	1	BSC
	BSC-04	Engineering Mathematics-II	3	1	0	4	BSC
	ESC-03	Programming for problem solving	2	0	0	2	ESC
	ESCL-03	Programming for problem Solving Lab	0	0	2	1	ESC
	ESC-04	Engineering Mechanics	3	0	0	3	ESC

	VSEC-02	Workshop-Manufacturing practices	0	0	4	2	VSEC
	IKS-01	IKS Bucket	2	1	0	3	AEC/VEC/IKS
	CC-02	NSS/Health & Wellness/Fine Arts/Visual Art/Performing Arts	1	0	2	2	CC
		Total	**14**	**2**	**10**	**21**	

Exit option with: * Consumer Electronic/Radio Engineering /Digital Electronics (Any one course), * Electronics Servicing and Maintenance, *Course on word processing, spread sheets and power point presentations.

Second Year

	Course Code	Course Title	L	T	P	Cr	Categorisation
SEM-III	PCC-01	Electronics Devices	3	0	0	3	PCC
	PCCL-01	Electronics Devices Lab	0	0	2	1	PCC Lab
	PCC-02	Digital Electronics	3	0	0	3	PCC
	PCCL-02	Digital Electronics Lab	0	0	2	1	PCC Lab
	PCC-03	Analog Circuits	3	0	0	3	PCC
	PCCL-03	Analog Circuits Lab	0	0	2	1	PCC Lab
	MDM-01	Probability Theory and Stochastic Processes	2	0	0	2	MD Minor
	OE-01	Open elective basket	4	0	0	4	OE
	HSSM-01	Employability and Skill Development	2	0	0	2	Entrepreneurship
	VEC-01	Universal Human Values	2	0	0	2	VEC
	ELC-01	Community Engineering Project (CEP)	0	0	4	2	CEP/FP
		Total	**19**	**0**	**10**	**24**	

Exit Option: Two suitable skill-based courses to qualify for Diploma. * Data Communication and Networking * Fault finding in Electronics system (Electronics Servicing and Maintenance) * PCB design and simulation.

	Course Code	Course Title	L	T	P	Cr	Categorisation
SEM-IV	PCC-04	Signals and Systems	3	0	0	3	PCC
	PCCL-04	Signals and Systems Lab	0	0	2	1	PCC Lab
	PCC-05	Microprocessors	3	0	0	3	PCC
	PCCL-05	Microprocessors Lab	0	0	2	1	PCC Lab
	PCC-06	Analog and Digital Communication	3	0	0	3	PCC
	PCCL-06	Analog and Digital Communication Lab	0	0	2	1	PCC Lab
	MDM-02	Numerical Techniques	2	0	0	2	MD Minor
	OE-02	Open elective basket	2	0	0	2	OE
	VSEC-03	PCB Designing	0	0	4	2	VSEC
	AEC-02	Marathi/Hindi/Sanskrit/Gujrati/Kannada	2	0	0	2	HSSM
	HSSM-02	Patents and IPR	2	0	0	2	Entrepreneurship
	VEC-02	Constitution of India	2	0	0	2	VEC
		Total	**19**	**0**	**10**	**24**	

Exit Option: Two suitable skill-based courses to qualify for Diploma. * Data Communication and Networking * Fault finding in Electronics system (Electronics Servicing and Maintenance) * PCB design and simulation.

Third Year

	Course Code	Course Title	L	T	P	Cr	Categorisation
SEM-V	PCC-07	Digital Signal Processing	3	1	0	4	PCC
	PCCL-07	Digital Signal Processing Lab	0	0	2	1	PCC Lab
	PCC-08	Electromagnetic Wave Theory	3	1	0	4	PCC
	PCC-09	Network Theory	3	0	0	3	PCC
	PEC-01	A. Fiber Optic Communication B. Control System C. Advanced Mobile Communication	3	1	0	4	PEC
	MDM-03	Power Electronics	3	1	0	4	MD Minor
	OE-03	Open elective basket	2	0	0	2	OE
		Total	**17**	**4**	**2**	**22**	

Exit Option: Any two skill-based courses 1. Advanced Mobile Communication 2. Cyber Security

OR

Any two courses on Communication Technologies, Digital design using Verilog, Computer networking, Embedded system design IoT, Satellite Tv Networks.

	Course Code	Course Title	L	T	P	Cr	Categorisation
SEM-VI	PCC-10	Computer Networks	3	0	0	3	PCC
	PCCL-10	Computer Networks Lab	0	0	2	1	PCC Lab
	PCC-11	VLSI Design	3	0	0	3	PCC
	PCCL-11	VLSI Design Lab	0	0	2	1	PCC Lab

	PEC-02	A. Digital Audio Processing B. Digital Image Processing C. Adaptive Signal Processing	3	1	0	4	PEC
	PEC-03	A. Microwave Theory & Techniques B. RF Circuit Design C. Wireless Sensor Networks	3	1	0	4	PEC
	MDM-04	Advanced Web Designing	2	0	0	2	MD Minor
	VSEC- 04	Basic Concepts of Film & Video Editing	3	0	0	3	VSEC
		Total	**17**	**2**	**4**	**21**	

Exit Option: Any two skill-based courses 1. Advanced Mobile Communication 2. Cyber Security

OR

Any two courses on Communication Technologies, Digital design using Verilog, Computer networking, Embedded system design IoT, Satellite Tv Networks.

Fourth Year

	Course Code	Course Title	L	T	P	Cr	Categorisation
SEM-VII	PCC-12	Antenna and Wave Propagation	3	0	0	3	PCC
	PEC-04	A. Biomedical Electronics B. Embedded System C. Introduction to Information Theory	3	0	0	3	PEC
	PEC-05	A. Introduction to MEMS B. Satellite Communication C. Soft Computing	3	0	0	3	PEC
	MDM-05	Electrical Vehicle	2	0	0	2	MD Minor
	ELC-02	Research Methodology	3	1	0	4	RM
	ELC-03	Project	0	0	8	4	Project
		Total	**14**	**1**	**8**	**19**	

	Course Code	Course Title	L	T	P	Cr	Categorisation
SEM-VIII	PCC-13	Digital Communication	3	0	0	3	PCC
	PEC-06	A. Data Structure	2	0	0	2	PEC
		B. Drone Technology					
		C. Data Compression & Encryption					
	MDM-06	Robotics and Automation	2	0	0	2	MD Minor
	ELC-04	Internship	0	0	24	12	Internship
		Total	**7**	**0**	**24**	**19**	

Syllabus for Electronics and Telecommunication Engineering (First year)

BSC01	Engineering Physics	3 Credits

Course Objectives:

1. To provide a firm grounding in the basic physics principles and concept to resolve many Engineering and technological problems.
2. To understand and study the Physics principles behind the developments of engineering materials.

Course Outcomes:

Students will be able to:

CO1: Students acquired basic knowledge of differential equation and can create wave equation and analysis of the intensity variation of light due to interference and polarization. Students are able to understand the light propagation in fibre and use of Laser in Science and engineering.

CO2: Students can apply the knowledge of quantum mechanics to set Schrödinger's equations.

CO3: Students will familiar with some of the basic laws related to electromagnetism and Maxwell's equation as well as properties of dielectrics.

CO4: Students are able to understand key principle and application of nuclear physics. Identify planes in crystal and characteristics measurements of cubic system.

CO5: Students are able to explain fundamental concepts of magnetism and they should analyze the properties of semiconducting materials and describe various applications of superconductor.

Unit I:

Engineering Optics: Interference: in thin film due to reflected light, wedge shaped film, Newton' Rings, Applications, Polarization: types of polarization, optical activity, specific rotation and Laurentz half shade polarimeter, Lasers: characteristics, Gas Laser, solid state Laser and semiconductor lasers, Applications of Lasers, Optical fibres: Acceptance cone, Numerical aperture, applications, Oscillations: free oscillations, forced oscillations and damped oscillation, resonance and it's condition.

UNIT-II:

Quantum Mechanics: Wave and particle duality of radiation – de Broglie concept of matter waves – Wave function and its physical significance, Heisenberg's uncertainty principle and it's application – Schrodinger's wave equation – eigen values and eigen functions, particle confined in one dimensional infinite square well potential, Introduction to quantum computing.

UNIT-III:

Electromagnetism: Differential and integral calculus: Operator, Concept of gradient, divergence and curl, Ampere's law, Faraday law, Gauss–Divergence theorem, integral and differential forms of Maxwell equations and their physical significance, EM waves in free space. Dielectrics: polarization, Types of Dielectric polarization, dielectric constant, polar - non polar dielectrics.

UNIT-IV:

Crystal Structure: Fundamental concepts, Crystal systems Cubic structure: Number of atoms, co-ordination number, packing fraction, Atomic radius, Miller indices, relation between 'ρ' and 'a'

Nuclear Physics**:** Nuclear properties Introduction to mass defect & packing fraction, Nuclear reaction: Q value of Nuclear reaction,- Radioactivity – properties of α, β and γ rays, GM Counter.

UNIT-V:

Physics of Advanced Materials: Types of magnetic materials, ferrites and garnets, magnetic domain and hysteresis curve, Semiconductors, conductivity of semiconductors, Hall Effect Superconductors: definition – Meissner effect – type I & II superconductors, Nanomaterials: introduction and properties – synthesis: top-down and bottom-up approach, Introduction to SCADA, XRD, FESEM, VSM and applications.

Text books:

1. Introduction to Electrodynamics –David R. Griffiths.
2. Concept of Modern Physics – Arthur Beizer. Tata McGraw-Hill Publishing Company Limited.
3. Optics –Ajoy Ghatak. MacGraw Hill Education (India) Pvt. Ltd.
4. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan. New Age International Pvt.Ltd.
5. Solid State Physics – A.J. Dekker. McMillan India –Limited.
6. The Feynman Lectures on Physics Vol I, II, III.
7. Introduction to Solid State Physics – Charles Kittel. John Willey and Sons
8. Engineering Physics – M.N. Avadhanulu and P.G. Kshirsagar.S.Chand and Company LTD.
9. Engineering Physics - R.K. Gaur andS. L. Gupta. Dhanpat Rai Publications Pvt. Ltd.-New Delhi.
10. Fundamental of Physics - Halliday and Resnik. Willey Eastern Limited.
11. Nanotechnology: An Introduction to Synthesis, Properties and Applications of Nanomaterials- Thomas Varghese , K. M. Balakrishna

BSCL01	Engineering Physics Lab	01 Credit

At least 08 experiments should be performed from the following list.

1. Newton's rings - Determination of radius of curvature of Plano convex lens / wavelength of light

2. Wedge Shaped film - Determination of thickness of thin wire
3. Half shade Polarimeter - Determination of specific rotation of optically active material
4. Laser - Determination of wavelength of He-Ne laser light
5. Magnetron Tube - Determination of 'e/m' of electron
6. G.M. Counter - Determination of operating voltage of G.M. tube
7. Crystal Plane – Study of planes with the help of models related Miller Indices
8. Hall Effect - Determination of Hall Coefficient
9. Four Probe Method - Determination of resistivity of semiconductor
10. Measurement of Band gap energy of Semiconductors
11. Experiment on fibre optics
12. B-H Curve Experiment
13. Experiments on SCADA

BSC02	Engineering Mathematics -I	[L:3;T:1] 4 Credits

Course Objectives:

1. To know the application of the matrix technique (Linear algebra) to find solutions of system of linear equations arising in many engineering problem.
2. To know and apply the concept partial derivatives and their applications to Maxima/ Minima, series expansion of multi valued functions.
3. To understand Computation of Jacobian of functions of several variables and their applications to engineering problems.
4. To identify and sketch of curves in various coordinate system.
5. To evaluate multiple integrals and their applications to area and volume.

Course Outcomes:

Students will be able to:

CO1: Apply the matrix technique (Linear algebra) to find solutions of system of linear equations arising in many engineering problem.

CO2: Demonstrate the concept partial derivatives and their applications to Maxima/ Minima, series expansion of multi valued functions.

CO3: Compute Jacobian of functions of several variables and their applications to engineering problems.

CO4: Identify and sketch of curves in various coordinate system.

CO5: Evaluate multiple integrals and their applications to area and volume.

Unit 1: Linear Algebra- Matrices

Inverse of a matrix by Gauss-Jordan method; Rank of a matrix; Normal form of a matrix ; Consistency of non- homogeneous and homogeneous system of linear equations ; Eigen values and eigen vectors ; Properties of eigen values and eigen vectors (without proofs); Cayley-Hamilton's theorem (without proof) and its applications.

Unit 2: Partial Differentiation

Partial derivatives of first and higher orders; Homogeneous functions – Euler's Theorem for functions containing two and three variables (with proofs); Total derivatives; Change of variables.

Unit 3: Applications of Partial differentiation

Jacobians-properties;Taylor"s and Maclaurin"s theorems (without proofs) for functions of two variables; Maxima and minima of functions of two variables; Lagrange"s method of undetermined multipliers.

Unit 4: Reduction Formulae and Tracing of Curves

Reduction formulae for $\int_0^{\frac{\pi}{2}} \sin^n x\,dx$, $\int_0^{\frac{\pi}{2}} \cos^n x\,dx$, $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x\,dx$; Tracing of standard curves given in Cartesian, parametric & polar forms.

Unit 5: Multiple Integra

Double integration in Cartesian and polar co-ordinates; Evaluation of double integrals by changing the order of integration and changing to polar form; Triple integral; Applications of multiple integrals to find area as double integral , volume as triple integral and surface area.

Text Books

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, NewDelhi.
2. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, NewYork.
3. A Course in Engineering Mathematics (Vol I) by Dr. B. B. Singh, Synergy Knowledgeware, Mumbai.
4. A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan,Pune.
5. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

Reference Books

1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
2. A Text Book of Engineering Mathematics by Peter O" Neil, Thomson Asia Pte Ltd. , Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., NewDelhi.

General Instructions:

1. The tutorial classes in Engineering Mathematics-I are to be conducted batchwise.
2. Each class should be divided into three batches for the purpose.
3. The internal assessment of the students for 20 marks will be done based on assignments, surprise tests, quizzes, innovative approach to problem solving and percentage attendance.
4. The minimum number of assignments should be eight covering all topics.

ESC01	Basic Electrical & Electronics Engineering	[L:2;T:1] 3 Credits

Course Objectives:

1. To know and apply basic ideas and principles of electrical engineering.
2. To Identify protection equipment and energy storage devices.
3. To differentiate electrical and electronics domains and explain the operation of diodes and transistors.
4. To acquire knowledge of digital electronics
5. To design simple combinational and sequential logic circuits.

Course Outcomes:

Students will be able to:

CO1: Apply basic ideas and principles of electrical engineering.
CO2: Identify protection equipment and energy storage devices.
CO3: Differentiate electrical and electronics domains and explain the operation of diodes and transistors.
CO4: Acquire knowledge of digital electronics
CO5: Design simple combinational and sequential logic circuits.

Unit 1: Elementary Electrical Concepts:

Fundamental of Electrical system Potential difference, Ohm's law, Effect of temperature on resister, resistance temperature coefficient, Electrical wiring system: Study of different wire gauges and their applications in domestic and industry. Energy Resources and Utilization: Conventional and nonconventional energy resources; Introduction to electrical energy generation from different resources, transmission, distribution and utilization, Advantages & Disadvantages of AC & DC transmission. Concept of Supply Demand, Power Factor, Need of unity factor.

Unit 2: Measurement of Electrical Quantities:

Measurement of Voltage, Current, and Power; Measurement of 3 phase power; Study of Energy meters. Study of Electrical Storage devices: Batteries such as Nickel-cadmium (NiCd), Lithium- ion (Li-ion), Lithium Polymer (Li-pol.) batteries. Study of circuit breakers & Actuators (MCB & MPCB, Power Contactors & Aux contactors, Electro-Mechanical & Solid state Relays)

Unit 3: Diodes and Circuits:

The P-N Junction Diode, V-I characteristics, Diode as Rectifier, specifications of Rectifier Diodes, Half Wave, Full wave, Bridge rectifiers, Equations for IDCVDC VRMS, IRMS,

Efficiency and Ripple Factor for each configuration. Filters: Capacitor Filter, Choke Input Filter, Capacitor Input Filter (Π Filter), Zener Diode, Characteristics, Specifications, Zener Voltage Regulator and Types of Diodes: LED, Photodiode

Unit 4: Semiconductor Devices and Applications:

Transistors: Introduction, Classification, CE, CB, and CC configurations, α, β, concept of gain and bandwidth. Operation of BJT in cut-off, saturation and active regions (DC analysis). BJT as an amplifier, biasing techniques of BJT, BJT as a switch.

Introduction to Digital Electronics: Number System, Basic logic Gates, Universal Gates, Boolean Postulates, De-Morgan Theorems

Reference/Text Books:

1. V. N. Mittal and Arvind Mittal, Basic Electrical Engineering, McGraw-Hill Publication.
2. Brijesh Iyer and S. L. Nalbalwar, A Text book of Basic Electronics, Synergy Knowledge ware Mumbai, 2017.ISBN:978-93-8335-246-3
3. Vincent DelToro, Electrical engineering Fundamentals, PHI Publication, 2nd Edition, 2011.
4. Boylstad, Electronics Devices and Circuits Theory, Pearson Education.
5. Edward Hughes, Electrical Technology, Pearson Education.
6. D. P. Kothari and Nagrath, Theory and Problems in Electrical Engineering, PHI Publication, 2011.
7. B. L. Theraja, Basic Electronics, S. Chand Limited, 2007.
8. Millman Halkias, Integrated Electronics-Analog and Digital Circuits and Systems, McGraw-Hill Publication, 2000.
9. Donald Neaman, Electronic Circuit Analysis and Design, McGraw-Hill Publication, 3rd Edition.
10. Donald Neaman, Electronic Circuit Analysis and Design, McGraw-Hill Publication, 3rd Edition.
11. Printed Circuit Boards Design &Technology, WalterC. Bosshart, McGraw-Hill Publication.

Note: Students are advised to use internet resources whenever required.

ESCL-01	Basic Electrical & Electronics Engineering Lab	1 Credit

At least 08 experiments should be performed from the following list

List of Experiments:

1. Measure voltage current and power in 1 phase circuit with resistive load.
2. Measure voltage current and power in R L series circuit.
3. Determine transformation ratio (K) of 1 phase transformer
4. Connect single phase transformer and measure input output quantities.
5. Identify various passive electronic components in the given circuit.
6. Connect resistors, capacitors in series and parallel combination on bread board and measure its value using multimeter.

7. Identify various active electronic component in the given circuit.
8. Test the performance of PN junction diode.
9. Test the performance of Zener diode.
10. Test the performance of NPN transistor.

ESC-02 Engineering Graphics & Design 02 Credits

Course Objectives:

1. To prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
2. To prepare you to communicate effectively
3. To prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice

Course Outcomes:

Students will be able to:

CO1: Introduce the engineering design and its place in society
CO2: Expose to the visual aspects of engineering design
CO3: Expose to engineering graphics standards
CO4: Expose to solid modelling
CO5: Expose to computer-aided geometric design
CO6: Expose to creating working drawings
CO7: Expose to engineering communication

Unit 1: Traditional Engineering Graphics:
Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

Unit 2: Computer Graphics:
Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM).

Unit 3: Introduction to Engineering Drawing
Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

Unit 4: Projections

Orthographic Projections: Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes; Projections of Regular Solids: those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

Unit 5: Sectioning of Solids, Isometric Projections

Sectioning of solids: Section planes perpendicular to one plane and parallel or inclined to other plane. Isometric projections: Isometric scale, drawing of isometric projections from given orthographic views.

Reference/Text Books:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 46th Edition, 2003.
2. K. V. Nataraajan, A text book of Engineering Graphic, Dhanalakshmi Publishers, Chennai, 2006.
3. K. Venugopal and V. Prabhu Raja, Engineering Graphics, New Age International (P) Ltd, 2008.
4. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to Autocad, Mc GrawHill Education, 2017.

ESCL-02 Engineering Graphics & Design Lab 01 Credit

List of Experiments

1. Lines, lettering and dimensioning.
2. Geometrical Constructions.
3. Orthographic projections.
4. Projections of points and straight lines
5. Projections of planes.
6. Projections of solids.
7. Section of solids.
8. Isometric Projections.

AEC-01 Communication Skills 02 Credits

Course Objectives:

1. To know and apply speaking and writing skills in professional as well as social situations
2. To Overcome Mother Tongue Influence and demonstrate neutral accent while exercising English
3. To know and apply communication skills for Presentations, Group Discussion and interpersonal interactions.

4. To know and apply grammar correctly during Speaking and Writing situations especially in context with Presentations, Public Speaking, Report writing and Business Correspondence

Course Outcomes:

Students will be able to:

CO1: Apply speaking and writing skills in professional as well as social situations

CO2: Overcome Mother Tongue Influence and demonstrate neutral accent while exercising English.

CO3: Apply communication skills for Presentations, Group Discussion and interpersonal interactions

CO4: Apply grammar correctly during Speaking and Writing situations especially in context with Presentations, Public Speaking, Report writing and Business Correspondence

Unit 1: Communication and Communication Processes

Introduction to Communication, Forms and functions of Communication, Barriers to Communication and overcoming them, Verbal and Non-verbal Communication Reading: Introduction to Reading, Barriers to Reading, Types of Reading: Skimming, Scanning, Fast Reading, Strategies for Reading, Comprehension. Listening: Importance of Listening, Types of Listening and Barriers to Listening.

Unit 2: Verbal & Non-verbal Communication

Use of Language in Spoken Communication, Principles and Practice of Group Discussion, Public Speaking (Addressing Small Groups and Making Presentation), Interview Techniques, Appropriate Use of Non-verbal Communication, Presentation Skills, Extempore, Elocution.

Unit 3: Study of Sounds in English

Introduction to phonetics, Study of Speech Organs, Study of Phonemic Script, Articulation of Different Sounds in English.

Unit 4: English Grammar

Grammar: Forms of Tenses, Articles, Prepositions, Use of Auxiliaries and Modal Auxiliaries, Synonyms and Antonyms, Common Errors.

Unit 5: Writing Skills, Reading Skills & Listening Skills

Features of Good Language, Difference between Technical Style and Literary Style, Writing Emails, Formal and Informal English, Technical Reports: Report Writing: Format, Structure and Types Letter Writing: Types, Parts, Layouts, Letters and Applications, Use of Different Expressions and Style, Writing Job Application Letter and Resume.

Text books:

Mohd. Ashraf Rizvi, *Communication Skills for Engineers*, Tata McGraw Hill

Reference Books:

1. Sanjay Kumar, Pushp Lata, *Communication Skills*, Oxford University Press,2016

2. Meenakshi Raman, Sangeeta Sharma, *Communication Skills*, Oxford University Press, 2017.
3. Teri Kwal Gamble, Michael Gamble, *Communication Works*, Tata McGraw Hill Education, 2010.
4. Anderson, Kenneth. Joan Maclean and Tossny Lynch. Study Speaking: A Course in Spoken English for Academic Purposes. Cambridge: CUP, 2004.
5. Aswalthapa, K. *Organisational Behaviour*, Himalayan Publication, Mumbai (1991).
6. Atreya N and Guha, *Effective Credit Management*, MMC School of Management, Mumbai (1994).
7. Balan,K.R. and Rayudu C.S., *Effective Communication*, Beacon New Delhi(1996).
8. Bellare, Nirmala. *Reading Strategies*. Vols. 1 and 2. New Delhi. Oxford University Press, 1998.
9. Bhasker, W. W. S & Prabhu, N. S.: *English through Reading*, Vols. 1 and 2. Macmillan, 1975.
10. Black, Sam. *Practical Public Relations*, E.L.B.S. London (1972).
11. Blass, Laurie, Kathy Block and Hannah Friesan. *Creating Meaning*. Oxford: OUP, 2007.
12. Bovee Courtl and L and Thrill, John V. *Business Communication*, Today McGraw Hill, New York, Taxman Publication (1989).

AECL- 01 Communication Skill Lab 01 Credit

At least 10 experiments should be performed from the following list

1) How to introduce oneself?
2) Introduction to Phonemic symbols
3) Articulation of sounds in English with proper manner
4) Practice and exercises on articulation of sounds
5) Read Pronunciations/transcriptions from the dictionary
6) Practice and exercises on pronunciations of words
7) Introduction to stress and intonation
8) Rapid reading sessions
9) Know your friend
10) How to introduce yourself
11) Extempore
12) Group discussion
13) Participating in a debate
14) Presentation techniques
15) Interview techniques

VSEC 01 Design Thinking 02 Credit

Course Objective:

The objective of this Course is to provide the new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products which useful for a student in preparing for an engineering career.

Course Outcomes (CO):

Students will be able to:

CO1: Compare and classify the various learning styles and memory techniques and apply them in their engineering education.

CO2: Analyze emotional experience and Inspect emotional expressions to better understand users while designing innovative products.

CO3: Develop new ways of creative thinking and learn the innovation cycle of Design Thinking process for developing innovative products.

CO4: Propose real-time innovative engineering product designs and Choose appropriate frameworks, strategies, techniques during prototype development.

CO5: Perceive individual differences and its impact on everyday decisions and further create a better customer experience.

COURSE CONTENTS:

Unit 1: An Insight to Learning and Remembering Memory

Understanding the Learning Process, Kolb's Learning Styles, Assessing and Interpreting, Understanding the Memory process, Problems in retention, Memory enhancement techniques

Unit 2: Emotions and Basics of Design Thinking

Understanding Emotions: Experience & Expression, Assessing Empathy, Application with Peers, Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) –Empathize, Define, Ideate, Prototype, Test.

Unit 3: Problem Fixing and Process of Product Design

Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving, Process of Engineering Product Design, Design Thinking Approach, Stages of Product Design, Examples of best product designs and functions, Assignment – Engineering Product Design.

Unit 4: Prototyping & Testing

What is Prototype? Why Prototype? Rapid Prototype Development process, Testing, Sample Example, Test Group Marketing.

Unit 5: Design Thinking & Customer Centricity

Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design.

Text books:

1. Karmic Design Thinking by Prof. Bala Ramadurai,

References:

1. Design: Creation of Artifacts in Society by Prof. Karl Ulrich, U. Penn
2. Change by Design by Tim Brown.

SEMESTER II

BSC 03	Engineering Chemistry	3 Credits

Course Objectives:

1. To impart the knowledge of chemistry in the area of Engineering and Technology.
2. To capable the student to explain the importance of chemistry in various fields of Engineering.
3. To identify the concept of chemistry to lay the ground work for subsequent studies.

Course Outcomes:

Students will be able to:

CO1: Students should be able to understand and explain the basic concepts of Water treatment and capable to explain softening processes and water Characteristics.

CO2: Students should be able to classify and explain various types of Corrosion and should apply methods to minimize the rate of Corrosion.

CO3: Students should be able to classify and explain various types of coals and lubricants, its physical and chemical properties and industrial importance.

CO4: Students should know the concept of Electrochemistry and its importance.

CO5: Student should be able to understand and explain various instrumental methods of Analysis.

Unit 1: Water Treatment

Introduction, Hard and soft water, Disadvantages of hard water, Softening of water – Ion exchange process, Hot lime –soda process, Hardness and its determination by EDTA method, Dissolved oxygen (DO) and its determination by Winkler's method, Numerical based on hardness, Sewage water treatment.

Unit 2: Corrosion and its Control

Introduction, Fundamental reason of corrosion, Electrochemical corrosion (Wet Corrosion), Mechanism of Wet corrosion, Direct Chemical corrosion (Dry corrosion), Factors affecting the rate of corrosion, Types of corrosion-Pitting corrosion, Microbiological corrosion, Methods to minimize the rate of corrosion- Proper designing, Cathodic and anodic protection method.

Unit 3: Fuels and Lubricants

Fuels: Introduction, Classification of fuel, Calorific value of a fuel, Characteristics of a good fuel, Solid fuel- Coal and various types of coal, Analysis of coal- Proximate and Ultimate analysis, Liquid fuel- Refining of petroleum.

Lubricants: Introduction, classification of lubricants - Solid, Semi –solid and Liquid lubricants, Properties of lubricants: Physical properties – viscosity, viscosity index, surface tension, Flash point and Fire point. Chemical properties – acidity, saponification value.

Unit 4: Electrochemistry

Introduction, Electrical conductance, Conductance measurement by Wheatstone bridge method, Cell constant, Conductometric titrations, Glass electrode and its application for pH measurement, Ostwald's theory of acid- base indicator, Rechargeable batteries i) Lithium ion battery, ii) Lithium battery, Fuel cell (H2-O2), Advantages of fuel cell.

Unit 5: Instrumental Methods of Analysis

UV-Visible spectroscopy-Introduction, Laws of absorption -Beer's - Lambert's law, Instrumentation and working of double beam spectrophotometer.
Flame Photometry (Flame emission spectroscopy) - Introduction, Principle and working.
Chromatography- Introduction, Classification, Thin layer chromatography (TLC).
Brief discussion on IR spectroscopy.

Textbooks:

1. Jain P.C & Jain Monica, Engineering Chemistry, Dhanpat Rai& Sons, Delhi, 1992.
2. Bhal &Tuli, Text book of Physical Chemistry, S. Chand & Company, New Delhi.
3. Shikha Agarwal, Engineering Chemistry- Fundamentals and applications, Cambridge Publishers - 2015.
4. Gurudeep Chatwal and Sham Anand, Instrumental methods of Chemical Analysis, Himalaya Publishing House, New Delhi

Reference books:

1. Barrow G.M., Physical Chemistry, McGraw-Hill Publication, New Delhi.
2. O. G. Palanna , Engineering Chemistry, Tata McGraw-Hill Publication, New Delhi.
3. WILEY, Engineering Chemistry, Wiley India, New Delhi 2014.
4. S.S.Dara,Engineering Chemistry,McGraw Hill Publication,New Delhi.
5. Willard, Hobart H.; Merritt, Lynne L., Jr.; Dean, John A. Instrumental Methods of Analysis, American Chemical Society

BSCL03	Engineering Chemistry Lab	1 Credit

At least 10 experiments should be performed from the following list:

1. Determination of Hardness of water sample by EDTA method.
2. Determination of Chloride content in water sample by precipitation titration method.
3. Determination of Dissolve Oxygen in water by Iodometric method.
4. Determination of Percent purity of Bleaching Powder.
5. PH – metric Titration (Acid Base titration)
6. Conductometric Titration (Acid Base titration)
7. Surface tension
8. Viscosity
9. To determine Acidity of water sample.
10. To determine Calorific value of a fuel.
11. Determination of Acid value of an oil sample.
12. Determination of Saponification value of an oil sample.
13. To verify Beer's-Lambert's law.
14. To determine Alkalinity water sample.
15. Determination of rate of corrosion of metal.
16. To determine the maximum wavelength of absorption of a given solution by colorimeter.
17. Experiment on Chromatography.

Reference Books:

1. Systematic experiments in Chemistry, A. Sethi, New Age International Publication, and New Delhi.
2. Practical Inorganic Chemistry, A. I. Vogel, ELBS Pub.

3. Practical in Engineering Chemistry, S. S. Dara.

BSC04	Engineering Mathematics – II	[L: 3; T: 1] 4 Credits

Course Objectives:

1. To know and discuss the need and use of complex variables to find roots, to separate complex quantities and to establish relation between circular and hyperbolic functions.
2. To understand and solve first and higher order differential equations and apply them as a mathematical modelling in electric and mechanical systems.
3. To determine Fourier series representation of periodic functions over different intervals.
4. To demonstrate the concept of vector differentiation and interpret the physical and geometrical meaning of gradient, divergence &curl in various engineering streams.
5. To know and apply the principles of vector integration to transform line integral to surface integral, surface to volume integral &vice versa using Gree's, Stoke's and Gauss divergence theorems.

Course Outcomes:

Students will be able to:

CO1: Discuss the need and use of complex variables to find roots, to separate complex quantities and to establish relation between circular and hyperbolic functions.

CO2: Solve first and higher order differential equations and apply them as a mathematical modelling in electric and mechanical systems.

CO3: Determine Fourier series representation of periodic functions over different intervals.

CO4: Demonstrate the concept of vector differentiation and interpret the physical and geometrical meaning of gradient, divergence &curl in various engineering streams.

CO5: Apply the principles of vector integration to transform line integral to surface integral, surface to volume integral &vice versa using Green"s, Stoke"s and Gauss divergence theorems.

Unit 1: Complex Numbers

Definition and geometrical representation ; De-Moivre"s theorem(without proof) ; Roots of complex numbers by using De-Moivre"s theorem ; Circular functions of complex variable – definition ; Hyperbolic functions ; Relations between circular and hyperbolic functions ; Real and imaginary parts of circular and hyperbolic functions ; Logarithm of Complexquantities.

Unit 2: Ordinary Differential Equations of First Order and First Degree and Their Applications

Linear equations; Reducible to linear equations (Bernoulli's equation); Exact differential equations; Equations reducible to exact equations ; Applications to orthogonal trajectories , mechanical systems and electrical systems.

Unit 3: Linear Differential Equations with Constant Coefficients

Introductory remarks - complementary function, particular integral; Rules for finding complementary functions and particular integrals; Method of variation of parameters; Cauchy's homogeneous and Legendre's linear equations.

Unit 4: Fourier Series

Introductory remarks- Euler's formulae ; Conditions for Fourier series expansion – Dirichlet's conditions ; Functions having points of discontinuity ; Change of interval ; Odd and even functions expansions of odd and even periodic functions ; Half-rangeseries.

Unit 5: Vector Calculus

Scalar and vector fields:Gradient, divergence and curl; Solenoidal and irrotational vector fields; Vector identities (statement without proofs); Green's lemma, Gauss's divergence theorem and Stokes' theorem (without proofs).

Text Books

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, NewDelhi.
2. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, NewYork.
3. A Course in Engineering Mathematics (Vol II) by Dr. B. B. Singh, Synergy Knowledge ware,Mumbai.
4. A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan,Pune.
5. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

Reference Books

1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
2. A Text Book of Engineering Mathematics by Peter O‟ Neil, Thomson Asia Pte Ltd. , Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi.

General Instructions:

1. The tutorial classes in Engineering Mathematics-II are to be conducted batchwise. Each class should be divided into three batches for the purpose.
2. The internal assessment of the students for 20 marks will be done based on assignments, surprise tests, quizzes, innovative approach to problem solving and percentage attendance.
3. The minimum number of assignments should be eight covering all topics.

ESC 03 Programming for Problem Solving 2 Credits

Course Objective:

To develop logical skills and basic technical skills so that students should be able to solve basic computing problems. The students should be able to learn the basic of any computer programming language.

Course Outcomes:

Students will be able to:

CO1: To formulate simple algorithms for arithmetic and logical problems.

CO2: To translate the algorithms to programs (in C language).

CO3: To test and execute the programs and correct syntax and logical errors.

CO4: To implement conditional branching, iteration and recursion.

CO4: To decompose a problem into functions and synthesize a complete program using divide and conquer approach.

CO5: To use arrays, pointers and structures to formulate algorithms and programs.

CO6: To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

CO7: To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

Detailed contents:

Unit 1: Introduction to Programming

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.). Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

Unit 2: Arithmetic expressions and precedence, Arrays

Conditional Branching and Loops Writing and evaluation of conditionals and consequent branching Iteration and loops, Arrays (1-D, 2-D), Character arrays and Strings

Unit 3: Basic Algorithms

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Unit 4: Function and Recursion

Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference.

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Unit 5: Structures and Pointers

Structures, Defining structures and Array of Structures.

Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation).

Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

ESCL03	Programming for Problem Solving Lab	1 Credit

At least 08 experiments should be performed from the following list:

1. Familiarization with programming environment
2. Simple computational problems using arithmetic expressions
3. Problems involving if-then-else structures
4. Iterative problems e.g., sum of series
5. 1D Array manipulation
6. Matrix problems, String operations
7. Simple functions
8. Programming for solving Numerical methods problems
9. Recursive functions
10. Pointers and structures
11. File operations

ESC04	Engineering Mechanics	3 Credits

Course Objective:

The objective of this Course is to provide an introductory treatment of Engineering Mechanics to all the students of engineering, with a view to prepare a good foundation for taking up advanced courses in the area in the subsequent semesters.

Course Outcomes:

Students will be able to:

CO1: To develop ability to model and analysis of mechanical engineering systems using vectoral representation of forces and moments.

CO2: To be able to draw the free body diagrams of mechanical components and systems.

CO3: Ability to draw shear force diagram and banding moment for different types of beams taking into consideration their elastic nature.

CO4: To understand the phenomenon of friction and ability to solve problem related to the same. Ability to apply the principles of virtual work.

Unit 1:

Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Solving Newton's equations of motion in polar coordinates; Problems including constraints and friction; Extension to cylindrical and spherical coordinates.

Unit II:
Potential energy function; F = - Grad V, equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, curl of a force field; Central forces; Conservation of Angular Momentum; Energy equation and energy diagrams; Elliptical, parabolic and hyperbolic orbits; Kepler problem; Application: Satellite manoeuvres;

Unit III:
Non-inertial frames of reference; rotating coordinate system: Five-term acceleration formula, Centripetal and Coriolis accelerations; Applications: Weather systems, Foucault pendulum;

Unit IV:
Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly damped oscillators; Forced oscillations and resonance.

Unit V:
Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion; Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion; Examples.

Unit VI:
Introduction to three-dimensional rigid body motion — only need to highlight the distinction from two-dimensional motion in terms of (a) Angular velocity vector, and its rate of change and (b) Moment of inertia tensor; Three-dimensional motion of a rigid body wherein all points move in a coplanar manner: e.g. Rod executing conical motion with center of mass fixed — only need to show that this motion looks two-dimensional but is three-dimensional, and two-dimensional formulation fails.

Reference Books:

1. Engineering Mechanics, 2nd ed. — MK Harbola
2. Introduction to Mechanics — MK Verma
3. An Introduction to Mechanics — D Kleppner & R Kolenkow.
4. Principles of Mechanics — JL Synge & BA Griffiths
5. Mechanics — JP Den Hartog
6. Engineering Mechanics - Dynamics, 7th ed. - JL Meriam
7. Mechanical Vibrations — JP Den Hartog
8. Theory of Vibrations with Applications — WT Thomson

VSEC 02 Workshop-Manufacturing Practices 2 Credits

Course Objectives:

1. To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
2. To have a study and hands-on-exercise on plumbing and carpentry components.
3. To have a practice on gas welding, foundry operations and fitting.
4. To have a study on measurement of electrical quantities, energy and resistance to earth.
5. To have a practice on soldering.

Laboratory Outcomes:

Students will be able to:

1. Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
2. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
3. By assembling different components, they will be able to produce small devices of their interest.

Workshop Practices

1. Machine shop
2. Fitting shop
3. Carpentry
4. Electrical & Electronics
5. Welding shop
6. Casting
7. Smithy
8. Plastic moulding& Glass Cutting

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Text/Reference Books:

1. AICTE's Prescribed Textbook: Workshop / Manufacturing Practices (with Lab Manual) ISBN: 978-93-91505-332.
2. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
3. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
4. Gowri P. Hariharan and A. Suresh Babu," Manufacturing Technology – I" Pearson Education, 2008.
5. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.

6. Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGraw Hill House, 2017.

IKS-01	IKS Subjects	2 Credits

IKS-01	Indian Art: Materials, Techniques and Artistic Practices	2 Credits

Course Objectives:

1. To introduce the diversity of art practices and material culture from the Indian subcontinent.
2. To situate these practices against their socio-cultural, political and temporal settings.
3. To support an immersive approach to understanding Indian art.
4. To bring together the recent findings in Indian art

Course Outcomes:
Students will be able to:

CO1: Draw connections between the historical artifacts and contemporary objects from the immediate surroundings.
CO2: Encourage themselves as an art practitioner, aspiring art historians, educators, and those preparing for competitive examinations in India.
CO3: Direct the possible ways of exploring these thematic.

Unit 1: Clay and Architecture I
Clay: Terracotta and Terracruda, How is clay processed into objects?, Brick structures and urns from the Indus Valley and Megalithic sites in south India, Sculptures of terracotta and bronze from Harappa, Terracruda or unbaked clay-made objects and rituals.
Architecture I: Basics of Buddhist and Jain architecture- Wood, stone and living rock, Stupa, vihara, caves and temples from Shunga, Kushana, Maurya and Gupta periods.

Unit 2: Pigment and Architecture II
Pigment: Mineral and vegetal colours- How pigment-based paints are processed and applied to walls Bhimbetka drawings, Murals of Sittanavasal and Ajanta.
Architecture II: Hinduism and temple building- Architectural treatise and utilisation of Vastupurusha mandala for making temples, Temples of Badami Chalukyas, Rashtrakuta, Chola, Chandela and Eastern Ganga dynasties.

Unit 3: Stone and Garden
Stone: Memorials, Architectural Remnants and Objects- Types of stone in India: Mathura Sandstone, Deccani Basalt, Rajasthani Marble, Stone carving for architecture, Hero stones and their social significance, Household items and objects in royal court.

Garden: Islam, the garden of paradise and afterlife, Tombs, palace, garden and waterways from the Mughal and Deccani context**,** Regional and foreign flora and fauna in Mughal and Deccani gardens.

Unit 4: Paper and Printing

How does paper affect the character of painting and calligraphy? How are ink and pigments prepared? Jain manuscripts and Islamic treatise, Mughal, Deccani, Rajput and Pahari miniature paintings, Mysore and Tanjore paintings.

Printing: European Interventions -Printmaking techniques and their application in books and images, Bazar paintings of Kalighat and Battala woodcuts**,** Lithograph and Oleograph from Calcutta, Pune and Lucknow

Unit 5: Multimedia Approaches

Introduction to the key developments in Indian Art after 1947, Post-independence artistic and design practices, Canvas painting, textile, furniture making between the 1950s and 1990s, Neoliberalism, transnational connections and "new media" approaches, Curatorial and collaborative projects between artists, educators and communities, Biennale, entrepreneurship and expansive notion of "art" after 2010.

Text Books/References:

1. Ali, Daud and Emma Flatt eds. 2020. Garden and landscape practices in pre-colonial India: histories from the Deccan. New Delhi: Routledge.
2. Dehejia, Vidya. 2006. Chola: Sacred Bronzes of Southern India. London: Royal Academy of Arts.
3. Goswamy, B. N., and Eberhard Fischer. 2017. Pahari Paintnings: The Horst Metzger collection in the Museum Rietberg. New Delhi: Niyogi Books.
4. Hardy, Adam. 2007. The Temple Architecture of India. Chichester (GB): J. Wiley and Sons.
5. Huntington, Susan. 1993. The Art of Ancient India: Buddhist, Hindu, Jain. New York: Weatherhill.
6. Koch, Ebba. 2001. Mughal Art and Imperial Ideology: Collected Essays. New Delhi: Oxford University Press.
7. Meister, Michael and M. A. Dhaky. 1999. Encyclopedia of Indian Temple Architecture. New Delhi: Manohar Publishers.
8. Mitter, Partha. 2001. Indian Art. Oxford and New York: Oxford University Press.
9. Sengupta, Paula. 2012. The Printed Picture: Four Centuries of Indian Printmaking. New Delhi: Delhi Art Gallery.
10. Singh, Kavita, ed. 2018. Scent upon a Southern Breeze: the synaesthetic arts of the Deccan. Mumbai: Marg.
11. Subramanyan, K. G. 2007. The Magic of Making: Essays on Art and Culture. Calcutta: Seagull.

Course Objectives:

1. To give an overview of science of meteorology.
2. Be aware of the working of world meteorological organization and different met communications/telecommunication network in India.
3. To make aware of effect of physical geography and earth's interior on meteorology.

Course Outcomes:

Students will be able to:

CO1: Remember various components of world meteorological organizations. (Remember)

CO2: Understand the met communications, telecommunications network in India and channels used in IAF. (Understand)

CO3: Understand the effect of physical geography, motions of the earth and on meteorological process. (Apply)

CO4: Apply the knowledge of earth's interior to analyse the meteorological phenomena. (Analyze)

CO5: Evaluate the measurement of time in prospective of meteorology. (Evaluate)

Unit 1: Science of Meteorology- An Overview

Introduction to meteorology, History of meteorology, General circulation.

Unit 2: Meteorological Organisation

World meteorological organization (WMO), Regional met centers, Indian Meteorological Department, Met organization in Indian Air force.

Unit 3: Motion of Earth and Measurement of Time

Introduction, Orbital and rotational characteristics of earth, Conversion of time and sidereal time.

Unit 4: Physical Geography and Structure of Earth

Insolation, The earth and its interior, Impact of physical geography.

Unit 5: Met Telecommunication

Global Telecommunication System, National Data Exchange Network, Meteorological Telecommunications in IAF.

Text Book (s)

1. WMO Training Manuals.
2. Manual of Meteorology for Air Crew - IAF Publication
3. General Meteorology – Byers HR.

Reference Books

1. Training Notes. Dept of Meteorology - AFA(Volume – 3)
2. Meteorology for Airman in India Part I – I Met D.