20BST01: FUNCTIONAL ENGLISH

Credits – 3 **Sessional Marks: 30**
L: T: P::3: 0: 0 **University Exam Marks: 70**

Course Objectives

1. To develop the knowledge of communicative grammar, enhance lexical capabilities by extensive practice exercises, build the vocabulary, and develop skimming and scanning skills using reading materials on different topics.
2. To enhance professional competence in reading, writing, listening and speaking.
3. To switch the approach from providing information about the language to use the language.
4. To minimize the Grammar Translation Method of ELT while trying to replace it with Direct Method.
5. To introduce Communicative Method of ELT and focusing the teaching pedagogy on the student-centered learning rather than on the teacher-centered learning.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Analyze the usage of English words in different contexts and acquire considerable flair in using broad range of vocabulary.

CO2. Upgrade comprehension of technical and academic articles and recognize writings as a process rather than a product.

CO3. Identify common errors in various parts of English and give effective expression in oral and written communication.

CO4. Explore various grammatical units of English and design a language component critically and coherently to meet desired needs within the realistic constraints.

UNIT I

The Secret of Work by Swami Vivekananda: Vocabulary Building: Root words from foreign languages and their use in English;Writing: Tenses; Identifying Common Errors: Subject-Verb agreement; Reading Comprehension.

UNIT II

Reaching for the Stars: Kalpana Chawla: Vocabulary Building: Word Formation; Writing: Sentence Structures, Use of phrases and clauses in sentences; Identifying Common Errors: Noun-Pronoun Agreement; Reading Comprehension.

UNIT III

A Retrieved Reformation by O. Henry: Vocabulary Building: Acquaintance with prefix and suffix from foreign languages in English to form derivatives; Writing: Importance of

proper punctuation, Creating Coherence, Describing; Identifying Common Errors: Misplaced Modifiers; Reading Comprehension.

UNIT IV

Water: The Elixir of Life by C.V. Raman: Vocabulary Building: Synonyms and antonyms; Writing: Paragraph writing, Précis Writing;Identifying Common Errors: Articles, Prepositions; Reading Comprehension.

UNIT V

The Post Office by Rabindranath Tagore: Vocabulary Building: Standard Abbreviations; Writing: Letter Writing; Identifying Common Errors: Use of Adjectives; Reading Comprehension.

Reference Books

1. Michael Swan, "Practical English Usage", OUP. 1995.
2. F.T. Wood, "Remedial English Grammar", Macmillan. 2007.
3. William Zinsser, "On Writing Well", Harper Resource Book. 2001.
4. Liz Hamp-Lyons and Ben Heasly. "Study Writing", Cambridge University Press. 2006.
5. Sanjay Kumar and PushpLata. "Communication Skills", Oxford University Press. 2011.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
CO1		H								M		L
CO2				M						H		M
CO3									M	H		L
CO4				M						H		M

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

20BSP01: FUNCTIONAL ENGLISH LAB

Credits -1 **Sessional Marks: 40**
L: T: P::0: 0: 2 **University Exam Marks: 60**

Course Objectives

1. To enhance communicative skills of the students with emphasis on Listening, Speaking, Reading and Writing skills.
2. To develop oral communication and fluency in Group Discussions, Just a Minute and Debates.
3. To enable the student to acquire the structure of written expressions required for their profession.
4. To enable the student to communicate in English for Academic and Social purpose.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Learn English speech sounds, analyze phonetic transcriptions
CO2. Understand the stress on word accent, intonation, and rhythm to acquire better pronunciation.
CO3. Acquire fluency in spoken English and neutralize mother tongue influence.
CO4. Upgrade listening skills and receive and interpret messages in the communication process.
CO5. Become active participants in the learning process and acquire proficiency in both ways of communication

UNIT I

Phonetics

i) Phonetics: Importance ii) Speech Sounds - Vowels and Consonants
iii) Phonetic Transcriptions

UNIT II

Pronunciation:i) Word Stress and Rhythm ii) Intonation: Rising tone, Falling tone.

UNIT III

Oral Communication:i) Group Discussions ii) Just a minute (JAM) iii) Debate iv) Situational Dialoguesv) Oral Presentation s

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

UNIT IV

Listening Skills

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UNIT V

Resume Writing, Interview Skills

Reference Books

1. Nira Konar, "English Language Laboratories: A Comprehensive Manual". PHI Learning Pvt. Ltd., 2011.
2. Michael Swan, "Practical English Usage", OUP. 1995.
3. William Zinsser, "On Writing Well", Harper Resource Book. 2001.
4. Liz Hamp-Lyons and Ben Heasly. "Study Writing, Cambridge University Press. 2006.
5. Sanjay Kumar and Pushp Lata. "Communication Skills", Oxford University Press. 2011.
6. Central institute of English & Foreign Languages. "Exercises in Spoken English. Parts. I-III", Hyderabad. Oxford University Press.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		**H**		**M**						**L**		
CO2		**L**		**M**						**H**		
CO3				**M**						**H**		
CO4		**M**								**H**		
CO5				**L**						**H**		**M**

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

20BST02: ENGINEERING CHEMISTRY

Credits – 4 **Sessional Marks: 30**
L: T: P::3: 1: 0 **University Exam Marks: 70**

Course Objectives

1. To impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
2. To strengthen the fundamentals of chemistry in Atomic Structure and then build an interface of theoretical concepts with the engineering applications.
3. To help students understand the fundamental concepts and achieve Advanced Knowledge about the interactions of Spectroscopy and solve problems related to them. An attempt has been made to logically correlate the topic with its application.
4. To Implement the concepts of chemistry in respect of Electrochemical cells, Thermodynamic process, mechanism of corrosion and factors to influence, polymers with their applications and analytical methods.
5. To understand the upcoming technologies like Fullerenes, carbonnanotubes, applications of Telecommunications in Nano materials.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Explain the basic concepts of Atomic and Molecular structures and the band theory of solids.

CO2. Solve problems related to the structure , purity and to study Molecular interactions by Spectroscopic methods

CO3. Apply knowledge of Substitute metals with Conducting polymers and also produce Bio-degradable polymers to reduce Environmental Pollution

CO4. Understand the mechanism of Electro Chemical corrosion of metals ,use of appropriate design criteria and apply corrosion protection techniques.

CO5. Give idea of synthesis, characterisation of Nanomaterials and applications of latest technology on Carbon Nano wires and medicinal applications.

UNIT I

Atomic and molecular structure: Schrodinger equation. Particle in a box solutions and their applications for conjugatedmolecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots ofthese functions to explore their spatial variations. Molecular orbitals of diatomic moleculesand plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energylevel diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition

metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

UNIT II

Spectroscopic techniques, applications and Organic reactions and synthesis of a drug molecule: Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and itsapplications in medicine. Vibrational and rotational spectroscopy of diatomic molecules.Applications. Nuclear magnetic resonance and magnetic resonance imaging, surfacecharacterization techniques. Diffraction and scattering. Introduction to reactions involving substitution, addition, elimination, oxidation, reduction,cyclization and ring openings. Synthesis of a commonly used drug molecule.

UNIT III

Polymers: Mechanism of polymerization and synthesis of polymers. Molecular weight, shape andconformation of polymers. Crystallinity, melting point and glass transition.Copolymerization. Viscoelasticity. Elastomers-structure, applications and curing. Conductingpolymers and applications. Dendrimers. Solubility of polymers. Fabrication and moulding ofpolymers. Synthesis, properties and uses of PE, PVC, PMMA, formaldehyde resins,melamine-formaldehyde-urea resins. Adhesives, adhesive mechanism and applications.Composites: characteristics, types and applications. Nanocomposites. Metallic and nonmetallic fillers.

UNIT IV

Surfactants and Lubricants and Corrosion: Methods of preparation, cleaning mechanism. Critical micelle concentration and itsdetermination. Hydrophobic and hydrophilic interactions. Micelles and reverse micelles.Detergents. Fricohesity of surfactants. Lubricants-physical and chemical properties, typesand mechanism of lubrication. Additives of lubricants and freezing points of lubricants.Thermodynamic overview of electrochemical processes. Reversible and irreversible cells.Chemical and electrochemical corrosion and mechanism of corrosion. Factors affecting corrosion. Protection of corrosion and practical problems of corrosion.

UNIT V

New Materials/Nanomaterials: Nanomaterials. Properties and application of fullerenes, fullerols, carbon nanotubes andnanowires. Synthesis-top down and bottom up approaches. Nanoelectronics. Applications ofnanomaterials in catalysis, telecommunication and medicine.

Text Books

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

1. Jain and Jain "Engineering Chemistry",15th Edition, Dhanapat rai publishing company.
2. K.N.Jayaveera, G.V.Subba Reddy, C.Ramachandraiah."Engineering Chemistry", 1st Edition, McGraw Hill Education (India) Private Limited,2013.

Reference Books

1. Jag Mohan, "Organic Spectroscopy",2nd Edition ,Narosa Publishing house,2007.
2. V.K.Ahluwalia and Rakesh kumar Parashar."Organic Reaction Mechanisms",3rd Edition,Narosa Publishing House,2007.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO 4	PO 5	PO6	PO7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO 1	H	M										
CO 2		H	L		H							
CO 3					M	H	H					
CO 4			H			H	L					
CO 5					H		M			H		

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

20BSP02: ENGINEERING CHEMISTRY LAB

Credits – 1 **Sessional Mark: 40**
L: T: P::0: 0: 2 **University Exam Marks: 60**

Course Objectives

1. To impart practical knowledge about some practical phenomena they have studied in the engineering Chemistry course.
2. To develop the experimental skills of the students.

Course Outcomes

After successful completion of the course the student should be able to
CO1. Understand the estimation of the acidity of water ,Dissolved Oxygen in different water samples ,estimation of chloride content of water and some ions etc.
CO2. Analyse and to measure the conductance and redox potentials of different solutions.
CO3. Develop knowledge pertaining to the appropriate selection of instruments for the successful analysis of complex mixture.
CO4. Apply the knowledge of various aspects of synthesis of drug

LIST OF EXPERIMENTS

(Minimum Seven are mandatory)

1. To determine the strength of KMnO4 solution by titrating it against a standard solution of Oxalic acid.
2. Determination of hardness of water by EDTA method.
3. Estimation of acidity of Water.
4. Estimation of Dissolved oxygen in water sample.
5. Determination of Iron by using potassium dichromate.

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

6. Estimation of copper by EDTA method.
7. Estimation of chloride in water sample.
8. Conductometric titration of strong acid with strong base.
9. Potentiometric titration of Iron by dichrometry method.
10. Colorimetric estimation of manganese
11. Synthesis of a polymer/ drug.
12. Thin layer chromatography.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H											
CO2		H										
CO3					H							
CO4						H						

20BST03: ENGINEERING PHYSICS

Credits – 4 **Sessional Marks: 30**
L: T: P::3: 1: 0 **University Exam Marks: 70**

Course Objectives

1. To understand this course is at the end of the course the students would be exposed to fundamental knowledge in various engineering subjects and applications.
2. To know the acquaintance of basic physics principles would help engineers to understand the vital role played by science and engineering in the development of new technologies.
3. To Familiarize basic concepts of quantum mechanics, semiconductors and superconductors will lead the students to solve some basic problems in the higher levels of their respective courses.
4. To Gain Knowledge of upcoming technologies like laser technology, fiber optics and Nanotechnology.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Explain the basic concepts of Quantum Mechanics and the band theory of solids.

CO2.Learn and to apply the basic concepts of properties of matter in day to day life.

CO3. Learn the types of Semiconductors and the role of carrier concentrations in conductivity. Understand the behaviour of materials at low temperatures and the applications of Super conductivity.

CO4. Understand the use of lasers in Engineering Science, Medicines & apply the concepts of optical fibre in communication systems.

CO5. Get a basic understanding of Nanotechnology. The course willgive idea of synthesis, characterisation of Nano materials and electrical & optical properties, applications of Nano systems.

UNIT I

Quantum Mechanics and Conducting Material: Introduction-wave nature of particles-De-Broglie Hypothesis-Time dependent and independent Schrodinger wave equation-Physical signification of wave function-particle in one dimensional infinite potential well-Heisenberg Uncertainty principle-Classical free electron theory-quantum free electron theory-Fermi Dirac Distribution.

UNIT II

Properties of Matter: Elasticity– Stress-strain diagram and its uses - factors affecting elastic Modulus and tensile strength – Torsion stress and deformations– twisting couple - torsion pendulum :theory and experiment -bending of beams- bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT III

Semiconductors and Superconductors: Semiconductors: Semiconducting materials: Intrinsic and extrinsic semiconductors – carrier concentration derivation – Fermi level – variation of Fermi level with temperature in intrinsic – electrical conductivity for intrinsic semiconductor –Hall Effect.

Superconductivity: Introduction - effect of magnetic field- Meissner effect- Types of superconductors - Flux quantization - Magnetic Levitation - BCS theory - Josephson Effect - Application of superconductors.

UNIT IV

Laser& Fiber Optics: Lasers: Einstein's theory of matter radiation interaction and A and B coefficients; Amplification of light by population inversion, different types of lasers: He-Ne Gas Laser, Ruby Laser -Coherence -applications in engineering science and medicine.

Fiber Optics: Light propagation through fibers –Acceptance angle – numerical aperture – types of fibers – step index, graded index – single mode, multimode – attenuation – dispersion– LED-Detector- application of fiber optics in communication

UNIT V

Nanotechnology: Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-gel, Precipitation, Combustion Methods; Top-down Fabrication: Chemical Vapour Deposition, Physical Vapour Deposition, Pulsed Laser Vapour Deposition Methods, Characterization(TEM)-Carbon Nan tubes (OD,1D,2D and 3D) – Applications.

Text Books

1. Avadhanulu M. N., "Engineering Physics", S. Chand & Co., 2007

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

2. K.Thiyagarajan,"Engineering Physics" McGraw Hill Education (India) Private Limited.

Reference Books

1. Gaur R K, Gupta S L, "Engineering Physics", Dhanpat Rai Publications, 2013.
2. R.Murugesan, Kiruthiga Sivaprasath,"Modern Physics"S.Chand&Company Pvt.Ltd, 2014.
3. Pillai, S.O., "Solid State Physics", New Age International Publication, New Delhi, Seventh Edition, 2015.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO 2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO 1	H	M										
CO 2			H		M							
CO 3			M			H	L					
CO 4					H					H		
CO 5				H			M				H	

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

20BSP03: ENGINEERING PHYSICS LAB

Credits - 1 **Sessional Marks: 40**
L: T: P::0: 0: 2 **University Exam Marks: 60**

Course Objective

1. To impart practical knowledge about some practical phenomena they have studied in the engineering physics course.
2. To develop the experimental skills of the students.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Apply knowledge of mathematics and physics fundamentals and an Instrumentation to arrive solution for various problems.

CO2. Understand the usage of basic laws and theories to determine various properties of the materials given.

CO3. Apply the theories learnt and the skills acquired to solve real time problems.

CO4. Carryout experiments to understand the laws and concepts of physics.

LIST OF EXPERIMENTS
(Minimum Six are mandatory)

1. Determination of Numerical aperture and bending losses of fibers of an optical fiber.
2. Young's modulus - non uniform bending – Pin and microscope
3. Calibration of voltmeter / ammeter using potentiometer

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

4. Spectrometer-Dispersive power of prism /grating.
5. Spectrometer- Determination of refractive index of given liquid using Hollow Prism.
6. Laser-Determination of wavelength.
7. Air Wedge- Determination of thickness of given thin wire.
8. V-I Characteristics of PN Junction diode.
9. Energy Gap Determination of a PN Junction Diode
10. Determination of surface tension of the given liquid-drop weight method.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	**PO 2**	**PO 3**	**PO 4**	**PO5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
CO 1	**H**											
CO 2		**H**										
CO 3			**H**									
CO 4	**H**				**H**					**H**		

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

20BST04: ENGINEERING MATHEMATICS – I

Credits - 4 **Sessional Marks: 30**

L: T: P:: 3: 1: 0 **University Exam Marks: 70**

Course Objectives

1. To introduce the mean value theorems and the fallouts of Rolle's Theorem that is fundamental to application of analysis to engineering problems.
2. To familiarize the students with techniques in integral calculus and introduce the idea of applying integral calculus to notations of curvature.
3. To acquaint the student with different effective mathematical tools for the solutions of differential equations that model physical processes.
4. To equip the students with standard concepts in vector calculus and its applications.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Identify the extrema of a function on an interval and classify them as maxima, minima or saddle using the first derivative test.

CO2. Calculate double and triple integrals and apply to measure the area of a plane and volume of a solid.

CO3. Use the tools of Calculus to sketch the graphs of functions, Critical points, intercepts, Asymptotes etc.

CO4. Solve second and higher order linear differential equations with constant coefficients.

CO5. Analyze the methods for finding the solutions of linear differential equations.

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

CO6. Memorize definitions of Curl, Gradient and Divergence of vector field and compute them.

CO7. Understand the statements of Stoke's, Green's and Divergence theorem and apply them in solving Engineering problems.

UNIT I

Calculus: Roll's and Mean value theorems, Taylor's theorem, Maclaurins theorem - Maxima & minima for functions of two variables – Curve tracing.

UNIT II

Multiple integrals: Double and triple integrals, Change of order of integration, Change of variables – Simple applications – areas & volumes.

UNIT III

Differential Equations-I: Exact, Linear and Bernoulli's equations, orthogonal trajectories; Homogeneous and Non-Homogeneous linear differential equations of second and higher order with constant coefficients.

UNIT IV

Differential Equations-II: Linear equations with variable coefficients-Euler equations, Method of variation of parameters, Simultaneous equations.

UNIT V

Vector Calculus: Gradient, Divergence, Curl and related properties; Line, surface and volume integrals; Stokes, Greens and Gauss-Divergence theorems.

Text books

1. Grewal, B.S. "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition.

Reference Books

1. T.K.V.Iyengar & B.Krishna Gandhi et., "Engineering Mathematics – I, II ";S. Chand & Company.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	H		L								
CO2	H	M		L								
CO3	H	H	M	L								

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
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Director
SoET,SPMVV

CO4	H	M	L									
CO5	H	M			L							
CO6	M	H			L							
CO7	M	H			L							

20BST05: ENGINEERING MATHEMATICS – II

Credits - 4 **Sessional Marks: 30**

L: T: P :: 3: 1: 0 **University Exam Marks: 70**

Course Objectives

1. Provides an introduction to Laplace Transforms
2. To Gain knowledge of matrices in a comprehensive manner and the convergence of series.
3. To Familiarize numerical methods for solving first-order IVPs
4. To introduce partial differential equations and make the student get acquainted with the basics of PDE.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Define Laplace transforms, Rank, Eigen Values and Eigen vectors, absolute and Conditional convergence

CO2. Understand Convolution theorem, Linear Dependence and Independence, Convergence and Divergence of sequences and series, Basic concepts of formation of Partial differential equations.

CO3. Apply Laplace transforms to solve ordinary differential equations and use appropriate numerical method to solve algebraic, Transcendental equations, ordinary differential equations.

CO4. Determine the Laplace transforms of standard functions and evaluate a definite integral numerically and demonstrate that any square matrix satisfy its characteristic polynomial and evaluate its minimal polynomial

CO5. Derive one – dimensional wave equation, Heat equation and Laplace equation

UNIT I

Laplace Transforms: Laplace transforms of standard functions, Transform of Periodic functions, Step function, Inverse transforms of derivatives and integrals, Convolution theorem, applications to solutions of ordinary differential equations.

UNIT II

Matrices: Rank, solution of system of linear equations, Eigen values, Eigen vectors, Cayley Hamilton theorem, Quadratic forms – Diagonalization.

Sequences and Series: Convergence and Divergence, Ratio test, Comparison test, Absolute and Conditional Convergence.

UNIT III

Partial Differential Equations: Formation of PDEs by elimination of arbitrary constants and arbitrary functions, Method of separation of variables, one dimensional wave equation, heat equation, Laplace equation.

UNIT IV

Solution of Algebraic and Transcendental Equations: The Bisection Method – The Method of False Position– Newton-Raphson Method, Solution of linear simultaneous equation by Gauss elimination method, Gauss matrix and Gauss – Seidal iteration method.

Interpolation: Newton's forward and backward interpolation formulae – Lagrange's formulae.

UNIT V

Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

Numerical solution of Ordinary Differential equations

Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method, Runge-Kutta Methods, Predictor-Corrector Method-Milne's Method.

Text books

1. Grewal, B.S. Higher Engineering Mathematics, Khanna Publishers, 42nd Edition.

Reference Books

1. T.K.V.Iyengar & B.Krishna Gandhi et., "Engineering Mathematics –I, II"; S. Chand & Company.

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M			L							
CO2	M	H			L							
CO3	H	L			M							
CO4	H	M			M							
CO5	M	H			L							

20BST06: ENGINEERING MATHEMATICS – III

Credits - 4 **Sessional Marks: 30**

L: T: P :: 3: 1: 0 **University Exam Marks: 70**

Course Objectives

1. To providing the student with the concepts of Fourier series, Fourier transforms which find the applications in engineering.
1. To make the student evaluate the Beta and Gamma functions, Bessel functions and Legendre polynomials that helps to solve many engineering and physical problems.
2. To Familiarize the concept of complex functions, analytic functions, harmonic functions and Cauchy – Riemann equations which play a vital role in several engineering problems.
3. To introduce the idea of poles and residues and calculation of residues at the poles; to discuss the Residue theorem and to use it to evaluate complex integrals.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Use Fourier analysis to periodic and non-periodic solutions.

CO2. Write given function in terms of sine and cosine terms in Fourier series.

CO3. Understand the statement of Fourier integral theorem and apply them in solving inverse transforms and finite Fourier transforms.

CO4. Solve improper integrals using Beta and Gamma functions.

CO5. Gain the adequate knowledge to tackle the engineering problems using the concepts analytic functions, complex functions, Cauchy – Riemann equation and also bilinear transformations.

CO6. Understand the definitions of poles, residues, singularities and apply them in solving Contour integration.

UNIT I

Fourier series: Determination of Fourier coefficients – Fourier series – Even and odd functions – Fourier series in an arbitrary interval – Even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

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UNIT II

Fourier Transforms: Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms - Parseval's formula.

UNIT III

Special Functions: Beta , Gamma and Bessel functions- Legendre polynomials-recurrence formulae -generating functions for $J_n(X)$ and $P_n(X)$- Rodrigue's formula-orthogonality of Legendre polynomials.

UNIT IV

Complex Functions-I: Analytical functions- Cauchy-Riemann equations-Conformal mapping-Bilinear transformations of $-e^z$, z^2 sinz and cosz.

UNIT V

Complex Analysis-II: complex integration –Evaluation of integrals-Cauchy's theorem-integral formula- Singularities-Poles –Residues-Contour Integration.

Text books

1. Grewal, B.S. "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition.

Reference Books

2. T.K.V.Iyengar & B.Krishna Gandhi et.," Engineering Mathematics – II, III"; S. Chand & Company.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

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Coordinator,Dept.of BS&H
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Prof.A.Ramakrishna
Director
SoET,SPMVV

CO1	H	M			L							
CO2	M	H			L							
CO3	H	L			M							
CO4	H	M			M							
CO5	M	H			L							

20BST07: PROBABILITY AND STATISTICS

Credits - 3 **Sessional Marks: 30**

L: T: P :: 2:1:0 **University Exam Marks: 70**

Course Objectives

1. To study the fundamental concepts like random variables, probability, probability distributions, sampling.
2. To understand the statistical concepts of estimation, hypothesis testing, regression, correlation analysis and multiple regression.
3. To equip students with essential tools for statistical analyses at the graduate level.
4. To familiarize the techniques of ANOVA designs and reliability most frequently used in engineering and applied research.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Find probabilities of single events, complementary events and the unions and intersections of collections of events.

CO2. Derive the probability density function of random variables and use these techniques to generate data for various distributions.

CO3. Calculate the mean and variance of continuous and discrete random variable.

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

CO4. Describes the Sampling distribution of mean when σ- known or unknown.
CO5. Differentiate between a population and a sample
CO6. Identify features that determine the width of a confidence interval.
CO7. State and apply the definitions of the t, F and χ 2 distributions in terms of the standard Normal.
CO8. Define the concept of least squares estimation in linear regression.
CO9. State the modelling assumptions underlying ANOVA.

UNIT I

Probability & Random Variables: Probability- Axioms of Probability-some elementary Theorems-Conditional probability-Baye's theorem. Random Variables: Discrete and Continuous random variables, Distribution function of random variable, Properties, Probability mass function, Probability density function, Mathematical expectation, Properties of Mathematical expectations, Mean and Variance.

UNIT II

Probability Distributions: Binomial Distribution, Mean and Standard Deviations of Binomial Distribution, Poisson distribution, Mean and Standard Deviations of Poisson Distribution. Continuous Distributions: Normal Distribution, Mean, Variance and area properties.

UNIT III

Sampling Distributions, Inferences concerning means, Inferences concerning variances
Populations and Samples, The Sampling Distribution of the Mean (σ Known), The Sampling Distribution of the Mean (σ Unknown), The Sampling Distribution of the Variance. Point Estimation, Interval Estimation, Bayesian Estimation, Tests of Hypotheses, Null Hypotheses and Significance Tests, Hypotheses Concerning One Mean, Operating Characteristic Curves, Hypotheses Concerning Two Means, The Estimation of Variances, Hypotheses Concerning One Variance, Hypotheses Concerning Two Variances.

UNIT IV

Test of Significance (small samples): Student's t – test, test for ratio of variance (or) F – test, Chi – square test for Goodness of fit and independence of attributes - The method of least squares-fitting a straight line, second degree parabolas and more general curves - Curvilinear Regression –Multiple Regressions, Correlation.

UNIT V

Anova: Analysis of variance - one way classification, two way classification, Completely Randomized Designs. Reliability – Failure –Time Distributions-The exponential Model Reliability –The Weibull Model in Life Testing.

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

Text books

1. T.K.V.Iyengar & B.Krishna Gandhi et. al, "Probability and Statistics", S. Chand & Company, Vol.III.
2. Irwin Miller, John E.Freund, "Probability and Statistics for Engineers", Pearson Global edition, 9th edition.
3. S C Gupta and V.K.Kapoor,"Fundamentals of Mathematical Statistics", S. Chand & Son's, 10th edition 2000.
4. Shahnaz Bathul,"A text book of Probability and Statistics", Ridge Publications, 2nd edition.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M										
CO2	H	L			M							
CO3	H	M										
CO4	H	L					M					
CO5	M	H					L					
CO6	M	H										
CO7	H	M										
CO8	H	M										
CO9	H	M										

20BST08: ECONOMICS AND ACCOUNTANCY

Credits – 4 **Sessional Marks: 30**
L:T:P::3:1:0 **University Exam Marks: 70**

Course Objectives

1. To impart in-depth knowledge of the subject and highlights the role of the economics, finance & accountancy in the field of engineering.
2. To strengthen the fundamentals of demand analysis & production function.
3. To estimate demand, price-output in different market structures.
4. To select the different investment alternatives
5. To know the financial position of the companies

Course Outcomes

After successful completion of the course the student should be able to

CO1. Define law of demand, assumption, production function & different types of costs

CO2. Apply demand forecasting techniques & BEP for estimation of demand & production

CO3. Identify the price-output in different competitions
CO4. Determine the feasible investment alternative.
CO5. Analyse the financial position of the company through ratio analysis.

UNIT I

Introduction to Economics: Economics – Micro & Macro Economics – Definitions - Significance & Limitations. Demand Analysis: Law of Demand, Demand Determinants. Elasticity of Demand: Definition, Types and Demand Forecasting methods.

UNIT II

Theory of Production: Firm and Industry – Production Function – Cobb Douglas Production function – Laws of returns – internal and external economies of scale. Break-Even Analysis: Concept of Break-even point (BEP) – Significance of BEP – Limitation - Assumptions - Break-even chart – Determination of BEP in volume and value (Simple problems).

UNIT III

Cost Analysis: Cost concepts, Fixed Vs Variable costs, explicit Vs implicit costs, Out-of-pocket costs Vs imputed costs and Opportunity cost. Introduction to Markets, Market structure, types of competition, features of Perfect competition, Monopoly, Monopolistic competition – Price output determination.

UNIT IV

Fundamentals of finance and Capital Budgeting: Capital and its significance – Types of Capital, Estimation of Fixed and Working Capital, requirements and methods of raising capital. Capital Budgeting Methods: Pay back method, Accounting Rate of Return (ARR) and Net Present Value (NPV) and IRR methods (Simple Problems).

UNIT V

Introduction to Financial Accounting and Financial Analysis: Double Entry Book Keeping – Journal, Ledger, Trial Balance, Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments. Ratio Analysis: Computation of Liquidity ratios (Current ratio and quick ratio), Activity Ratios (Inventory Turnover ratio, Debtors Turnover ratio) Capital Structure Ratios (Debt-equity Ratio and Interest Coverage ratio) and Profitability Ratios (Gross Profit ratio, Net Profit Ratio, Operating Ratio, P/E Ratio and EPS) Analysis and interpretation.

Text Books

1. Joel Dean, Managerial Economics, PHI 2001

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

2. James C. Van Home, Financial Management Policy
3. I.M. Pandy, Financial Management, PHI

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			**H**								**M**	**L**
CO2				**M**	**H**							**L**
CO3			**L**								**M**	
CO4				**L**	**M**						**H**	**L**
CO5				**M**							**H**	**L**

20BST09: INDUSTRIAL MANAGEMENT

Credits – 3 **Sessional Marks: 30**
L:T: P::3:0:0 **University Exam Marks: 70**

Course Objectives

1. To impact in-depth knowledge of the subject and highlights the role of the management in the field of engineering.
2. To strengthen the fundamentals of management functions and organisation structures.
3. To select the suitable type of organisation
4. To know the feasible location for the plant & layout
5. To understand the role of human resource management in organisations.
6. To select suitable marketing mix, channels of distribution for the organisation

Course Outcomes

After successful completion of the course the student should be able to

CO1. Define the function of management, organisation, material management & HRM

CO2. Evaluate the thoughts of management, performance of employees & job evaluation.
CO3. Identify the type & location of organisation.
CO4. Understand the functions of HRM
CO5.Determine the marketing mix, channels of distribution and PLC

UNIT I

Introduction to Management: Concept of Management - Functions of Management – Evaluation of Management Thought: Taylor's Scientific Management, Fayol's principles of Management, Douglas MC Gregor's theory X and Y, Maslow's Hierarchy of human needs.

UNIT II

Organisation: Concept - Principles of organisation. Organisational Structure: Line Organisation, Functional Organisation and Line and Staff Organisation. Types of Business Organisations: Features, Merits and Demerits of Sole trading Proprietorship, Partnership, Joint stock Companies.

UNIT III

Introduction to Operations Management: Plant location and Layout, Methods of Production. Work-study: Method study- Procedure and charts. Work measurement – procedure & work sampling. Materials Management: objectives of inventory control - EOQ & ABC analysis.

UNIT IV

Introduction to Human Resource Management: The concept of HRM. Functions of the HR manager - Manpower planning, Recruitment, Selection, Training and Development, Performance Appraisal and Job evaluation.

UNIT V

Marketing: Marketing – Definition – Marketing concepts – Marketing Environment - Marketing Mix, Marketing Vs Selling, Stages in Product Life Cycle, Channels of Distribution.

Text Book

1. A.R. Aryasri , Management Science for JNTU (B.Tech), TMH, 2002

Reference Books

1. Koontz and O'Donnel, Principles of Management, MC Graw Hill, 2001
2. Phillip Kotler, Marketing Management (11th Ed 2002) Prentice Hall of India.
3. Gary Dessler, Human Resource Management, Pearson Education, Asis, 2002
4. O.P. Khanna, Industrial Engineering & Management, Dhanpat Rai 1999

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

5. Chandra Bose, Management and Administration, Prentice Hall, 2002
6. W. Glueck & L.R. Jauch, Business Policy and Strategic Management, MC Graw Hill,

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1								**H**				
CO2					**M**				**H**			**L**
CO3									**H**		**M**	
CO4					**L**				**H**		**M**	**L**
CO5									**H**		**M**	**L**

20BST10: ENTREPRENEURSHIP & PROJECT MANAGEMENT

Credits – 3 **Sessional Marks: 30**
L:T: P::3:0:0 **University Exam Marks: 70**

Course Objectives

1. To understand the principles & phases of projects
2. To identify the resources of the project & duration.
3. To know the role entrepreneurship in economic development
4. To understand the problems of SSE
5. To learn the design & preparation of business plan.

Course Outcomes

After successful completion of the course the student should be able to

CO1. Define the concepts of project, engineering project design, and prototyping and feasibility study
CO2. Evaluate product duration, cost & quality control charts
CO3. Identify the ways to enhance economic development
CO4. Capable to maintain the problems of SSE and SWOT analysis
CO5. Design the business plan

UNIT I

Project Management: Concept of project - Project Life Cycle Phases – Human centred Engineering Project Design – Design thinking – Principles – Preliminary project specification – Feasibility Study – Detailed Project Design - Prototyping Methods – Validation of project with users.

UNIT II

Project Evaluation Techniques: PERT - CPM - Statistical Quality Control: X & R charts, P & C charts - Report preparation - Incubation – Concept – Support System.

UNIT III

Introduction to Entrepreneurship: Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs Manager, Entrepreneur vs Entrepreneur. The Entrepreneurial decision process. Role of Entrepreneurship in Economic Development – Problems faced by women entrepreneurs – Support System for entrepreneurs.

UNIT IV

Small Scale Enterprise: Definition, Characteristics, Role of Small Enterprise in Economic Development, Problems of SSE, and Steps involved to start SSE, Package for promotion of Small Scale Enterprise, SWOT Analysis.

UNIT V

Business Model Design: Innovation readiness to commercialisation – Business Plan Preparation - Venture capital support system – Start-up support system and Review of Indian start-up business models.

Reference Books

1 L.S. Srinath, PERT/CPM, Affiliated East-West Press, New Delhi , 2002
2 S. Choudary, Project Management, McGraw Hill Education (India) Private Limited, New Delhi.
3 S.S.Khanka, Entrepreneurial Development, S Chand & Company Ltd., New Delhi.

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					**M**		**L**					
CO2					**M**						**H**	**L**
CO3									**L**			
CO4				**M**					**M**			**L**
CO5					**H**				**M**		**H**	**L**

20BST11: CONSTITUTION OF INDIA

Credits – No credits
L:T: P::3:0:0

Course Objectives

1. To learn basic concepts of Indian Constitution.
2. To understand Fundamental Rights, Fundamental Duties and its implications.

Course Outcomes

After successful completion of course the student should be able to

CO1. Acquire the knowledge of Indian constitution.

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
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Prof.A.Ramakrishna
Director
SoET,SPMVV

CO2. Understand the Fundamental Rights, Directive Principles of State Policies and Fundamental Duties.

UNIT I

Constitution-structure and principles: Meaning and importance of Constitution, making of Indian Constitution, salient features of Indian constitution.

UNIT II

Fundamental Rights and Directive Principles of State Policy: Fundamental Rights , Fundamental Duties, Directive Principles.

UNIT III

Government of the Union: President of India – election, powers and functions, Prime Minister and Council of Ministers, Loksabha - composition and powers, Rajyasabha - composition and powers.

UNIT IV

Government of states: Governor - powers and functions, Chief Minister and Council of Ministers, Legislative Assembly and Legislative Council.

UNIT V

Judiciary: Features of Judicial System in India, Supreme Court, High court- structure and Jurisdiction.

Administrative Organizations and Construction: Federalism in India, local government – panchayat, election commission, citizen oriented measures - RTI and PIL significance and provisions.

Text Books

1. HM Seervai ,"Constitutional Law of India",Universal Law Publishing Co Ltd
2. Parvinrai Mulwantrai Bakshi, Constitution of India, LexisNexis,2019.

Reference Books

1. Dr.J.N.Pandey," Constitutional Law Of India", Central Law Agency,Allahabad, 2019
2. Durga Das Basu, Shorter Constitution of India, LexisNexis, 2019.

20BST12: ENVIRONMENTAL STUDIES

Credits – No credits

L:T:P::3:0:0

Course Objectives

1. To reflect on how the natural and built environments shape and are shaped by multiple socio-cultural and political factors.

2. To think across and beyond existing disciplinary boundaries, mindful of the diverse forms of knowledge and experience that arises from human interactions with the world around them.
3. To live responsibly and appreciate the environmental and cultural histories of the places they inhabit.
4. To nurture knowledge, respect, and love for the natural and human communities of central Maine, the place where they spend four formative years of their lives.
5. To develop skills of analysis and communication, bearing in mind disciplinary traditions and diverse publics.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.

CO2. Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.

CO3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.

CO4. Appreciate that one can apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.

CO5. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

UNIT I

Environmental studies and Natural resources-Definition of environment, scope and importance of environment, environmental studies, need for public awareness.

Renewable and **Non Renewable Resources and associated problems and case studies-** Uses, consequences of exploitation and remedies- (i) Water resources,(ii) Forest resources, (iii) Land resources, (iv) Mineral resources, (v) Food resources, (vi) Energy resources. Role of individual in conservation of natural resources. Equitable use of resources for sustainable life styles.

UNIT II

Environmental Pollution and Global Effects - Definition, Causes, Effects and Control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution and Noise pollution . Case studies. Role of an individual in prevention of pollution.

Solid waste Management- Causes, effects, disposal methods, and control of urban and industrial wastes.

Climate change- Global warming, Acid rain and Ozone layer depletion, Nuclear accidents and holocaust-case studies.

UNIT III

Disaster Management – Floods, earth quake, cyclone, avalanches, landslides and Tsunami.

Environment and Human health – Epidemic diseases, and pathology of Hepatitis –b, HIV/AIDs Malaria, Typhoid, Chikungunya, Avian flu and anthrax *etc.* Role of information technology in environment and human health, Case studies

Water conservation- Rain water harvesting – Water shed management.

Waste land reclamation

UNIT IV

Ecosystem- Concept of an ecosystem, Structure and functions of an ecosystem; types of ecosystems, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids. Types of ecosystems- characteristic feature, structure and functions.

Biodivesity and its conservation –Introduction; Definition; genetic, species and ecosystem diversity; Endangered and endemic species of India; Value of biodiversity- consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, national and local level; Importance of biodiversity; Biodiversity hot-spots; India as a mega-diversity nation. Threats to biodiversity: habitats loss, poaching of wild life man wild life conflicts. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT V

Human population and the environment-Population growth and variation among nations, Population explosion - Family welfare program in specific to women and child, Human rights, Value education.

Environment Impact Assessment; Environmental risk assessment (ERA); Clean production and Life cycle assessment.

Environmental Legislation - Forest Act, Water Act, Air act, Wild life protection Act, Environmental protection Act. Issues involved in enforcement of environmental legislation and public awareness.

Reference Books

1. Kaushik & Kaushik, Environmental Studies, New age international Publishers, 4th Edition,
2. B.R. Shah and Snehal Popli, Environmental Studies, Mahajan Publishing House. 9th Edition,
3. C.S. Rao, Environmental Pollution Control Engineering, 2ndEdition, New age International Publishers.
4. Canter, L.W., Handbook of Environmental Impact Assessment, Vol. I and II', The World Bank, Washington, 1991.

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

5. Pelczer, Jr., M.J., Chan, E.C.S., Krieg, R. Noel., and Pelczer Maerna Foss, 'Microbiology'. 5th Edition Tata Mc Graw Hill Publishing Company Limited, New Delhi-1996.
6. Metcalf & Eddy, Inc. "Wastewater Engineering Treatment Disposal and Reuse", Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi-1995.
7. Casey.I.J., 'Unit Treatment processes in Waste water engineering', John Wiley & Sons England, 1993.
8. Erach Bharucha, "Text book of Environmental Studies, UGC
9. DD Mishra,"Fundamental concepts in Environmental Studies", S Chand & Co Ltd

20BST13: ESSENCE OF INDIAN KNOWLEDGE TRADITION

Credits – No credits
L:T:P::3:0:0

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

Course Objectives

1. To impart basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge systems connecting society and nature.
2. To impart holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
3. To focus on introduction to Indian knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.
4. To focuses on Indian Philosophical traditions , Indian linguistic Tradition and Indian artistic tradition.

Course Outcomes

After successful completion of course the student should be able to

CO1. The student will be able to understand, connect up and explain basics of Indian Traditional knowledge in modern scientific perspective.

UNIT I

The basic structures of Indian knowledge system: Vedas – vedangas, Upavedas – Ayurveda, Dhanurveda, Gandharvaveda, Vedic gods – Agni, Indra, Varuna, Vishnu, Importance of the study of the vedic hymns.

UNIT II

Modern sciences and Indian knowledge system: Vedic cosmology, Indian atomic theory, Matter life and Mind –Sri Aurobindo .

UNIT III

Yoga and Holistic Health Care: Mind and its Modes, Afflictions, Threefold pain, Dispositions, Levels of Attention ,

Astanga Yoga.

UNIT IV

Indian Philosophical Tradition: Asatika darshanas - Nyaya, Vaisesika, Sankhya, Yoga, Mimamsa, Vendanta. Nastika darshanas – Carvaka, Jaina Buddhism

UNIT V

Indian Linguistic and Aristic Tradition: Phonology - (sabda), Morphology (pada), syntax (vakya), Semantics,Vakhyartha, Chitrakala, Murthikala, vasthukala

Reference Books

1. S. Radha Krishna , Indian Philosophy ,Oxford Indian Paper backs, New Delhi.
2. V.SivaramaKrishnan (Ed.), Cultural Heritage of Indian - course material , Bharatiya Vidya Bhavan ,Mumbai. 5th Edition, 2014

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

3. Smami Jitatmanand , Modern Physics and Vedant , Bhartiya Vidya Bhavan.
4. Smami Jitatamanad , Holistic Science and Vedant , Bhartiya Vidya Bhavan.
5. Fritz of capra ,Tao of Physics.
6. Fritz of capra ,The Wave of Life
7. VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta , International Chinmay Foundation ,Velliarnad,Arnakulam .
8. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata .
9. GN Jha (Eng. Trans.), Ed. RN Jha , Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakashan , Delhi 2016.
10. RN Jha, Science of Consciousness Psychotherapyand Yoga Practices, Vidyanidhi Prakashan ,Delhi 2016
11. PB Sharma (English translation), Shodashang Hridayan .

20BST14: LSRW SKILLS

Credits – 3 **Sessional Marks: 30**
L:T:P::3:0:0 **University Exam Marks: 70**

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

Course Objectives

1. To facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
2. To focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
3. To improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
4. To impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
5. To provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes

After successful completion of the course the student should be able to

CO1.Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English

CO2. Apply grammatical structures to formulate sentences and correct word forms

CO3. Analyze discourse markers to speak clearly on a specific topic in informal discussions

CO4.Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.

CO5. Create a coherent paragraph interpreting a figure/graph/chart/table

UNIT I

Listening: Identifying the topic, the context and specific pieces of information **Speaking:** Introducing oneself and others **Reading:** Skimming for main idea, Scanning for specific pieces of information **Writing/Reading for Writing:** Paragraphs, beginnings, introducing the topic, key words, main idea, Summarising the main idea **Grammar and Vocabulary:** Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

UNIT II

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts **Speaking:** Discussion in pairs/small groups on specific topics; preparing and delivering short structured talks using suitable cohesive devices **Reading :** Identifying sequence of ideas, Recognising verbal techniques that help link the ideas in a paragraph **Writing/Reading for Writing:** Paragraph writing (specific topics) using suitable cohesive devices; using key words/phrases and organising points in a coherent manner, Mechanics of writing punctuation, Capital letters **Grammar and Vocabulary:** Cohesive

devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions.

UNIT III

Listening: Listening for global comprehension, Summarising what is listened to **Speaking:** Discussing specific topics in pairs/small groups, Reporting what is discussed Reading : Reading a text in detail by making basic inferences, Recognising and interpreting specific context clues, Strategies to use text clues for comprehension Writing/Reading for Writing: Summarising – identifying main idea/s, Rephrasing what is read, Avoiding redundancies and repetitions Grammar and Vocabulary: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

UNIT IV

Listening: Making predictions while listening to conversations/ transactional dialogues without video, Listening with video **Speaking:** Role- plays for practice of conversational English in social and academic contexts (formal & informal), Asking for and giving information/directions/instructions/suggestions **Reading :** Understand and interpret graphic elements used in texts (convey information, reveal trends/patterns/relationships, communicate processes or display data) **Writing/Reading for Writing:** Information transfer, Describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables **Grammar and Vocabulary:**Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

UNIT V

Listening: Identifying key terms, Understanding concepts, Answering a series of relevant questions that test comprehension **Speaking:** Formal oral presentations on topics from academic contexts – without the use of PPT slides **Reading :** Reading for comprehension **Writing/Reading for Writing:** Writing structured essays on specific topics using suitable claims and evidences **Grammar and Vocabulary:** Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Text Books

1. English all round: Communication Skills for Undegurdation Learners Vol. I, Orient BlackSwan Publisers, First Edition 2019.

Reference Books

1. Stephen Bailey, “Academic writing: A handbook for international students”, Routledge, 2014.
2. Becky Tarver Chase, “Pathways: Listening, Speaking and Critical Thinking”, Heinley

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

ELT; 2nd Edition, 2018.

3. Martin Hewings, “Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational. Cambridge Academic English (B2)”, CUP, 2012.

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		**H**		**M**						**L**		
CO2	**H**		**M**	**L**								
CO3				**L**		**M**				**H**		
CO4				**H**			**L**			**M**		
CO5			**M**	**L**						**H**		

20BST 15: DATA ANALYTICS FOR DECISION MAKING

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

Credits – 3 **Sessional Marks: 30**
L:T: P::3:0:0 **University Exam Marks: 70**

Course Objectives

1. To familiarise python programming for data analytics
2. To Know the data analytics in production and marketing
3. To learn the data analytics in finance & human resource management

Course Outcomes

After successful completion of course the student should be able to
CO1. Understand the techniques in python
CO2. Analyze production and marketing related information
CO3. Understand the analytics models in finance & human resource management

UNIT I

Data analytics: Predictive (forecasting), Descriptive (business intelligence and data mining), Prescriptive (optimization and simulation) & Diagnostic analytics **-** Methods of Data Science: Classification, Regression & Similarity matching **-** Algorithms Used in Data Science: K-Means Clustering Algorithm, Association Rule Mining Algorithm, Linear Regression Algorithms, Logistic Regression, Support vector machine (SVM), Apriori, EM (expectation-maximization), AdaBoost & Naïve Bayesian **–** Creation of ad hoc analysis, business intelligence, historical data, predictive analytics, decision making, structured data & unstructured data**-** Big Data Toolkit- Data storage, Profiling tools, Data mapping tools, Data analysis, Data visualization, Data monitoring -Case studies using python.

UNIT II

Python – Introduction – Flow control – Functions – Datatypes – File handling – Object & class – Tutorials & Case studies.

UNIT III

Data Analytics for Production Management System: Operational efficiency models, product manufacturing models, Expected production time and material consumption models – Automated Management System using sensors, press monitors, line integrator, central serves with data base- Obtaining Asset Performance and Efficiency Gains, Improving Production Processes and Supply Chains, Making Product Customization and Feasible models - Case studies using python.

UNIT IV

Financial Analytics: Predictive financial analytics, Client profitability analytics, organisation profitability analytics, Cash-flow analytics, Value-driven analytics & Shareholder value analytics – Stock market analytics, financial control system analytics, financial engineering – Case studies using python.

UNIT V

HR Analytics: Definition**,** Employee Churn Analytics, Capability Analytics, Organizational Culture Analytic, Capacity Analytics & Leadership Analytics - HR Metrics Dashboard**:** To monitor human capita - Predictive HR Analytics **-** Benefits of HR Analytics**,** payroll analytics – Case studies using python.

Data analytics in Marketing: The new context of data around customers, Big Data - Big Opportunity, From Big Data to Big Marketing Outcomes: Next best action to engage customers, Personalization of online shopping, Monetizing big data for targeted dynamic advertisement, Machine-to-machine (M2M) analytics to improve product life-cycle management – Case studies using python.

Reference Books

1. Bill Lubanovic, O'Reilly Media;" Introducing Python: Modern Computing in Simple Packages", 2nd Edition .

Web References

https://www.edureka.co/blog/what-is-data-analytics/

https://www.mastersindatascience.org/resources/what-is-data-analytics/
https://www.embien.com/production-management-system
https://www.forbes.com/sites/bernardmarr/2016/04/07/6-key-financial-analytics-every-manager-should-know/#6fb08a4755de

https://www.informs.org/ORMS-Today/Public-Articles/October-Volume-40-Number-5/Big-data-analytics-in-marketing

https://www.questionpro.com/blog/hr-analytics-and-trends/

Course Outcomes – Program Outcomes (CO-PO) Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					H							
CO2					M						H	
CO3					M						H	

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

20BST16 UNIVERSAL HUMAN VALUES AND ETHICS

Credits – 3 **Sessional Marks: 30**
L:T: P::3:0:0 **University Exam Marks: 70**

Course Objective:

The objective of the course is four fold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

Course Outcomes:

By the end of the course,

- Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
- They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability.
- They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

UNIT I

Course Introduction – Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values--I
- Self-Exploration-what is it? – Its content and process; 'Natural Acceptance' and Experiential Validation – as the process for self-exploration
- Continuous Happiness and Prosperity – A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility – the basic requirements for fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking- disliking

UNIT II

Understanding Harmony in the Human Being – Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' – happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body : Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.
  Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT III

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

  Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

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UNIT IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature - recyclability and self-regulation in nature

Dr.B.Vishali
Coordinator,Dept.of BS&H
SoET,SPMVV

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Director
SoET,SPMVV

- Understanding Existence as Co-existence of mutually interacting units in allpervasive space
- Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Book

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. FSchumacher. "Small is Beautiful"

Dr.B.Vishali
Coordinator,Dept.of BS&H
SoET,SPMVV

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Director
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6. Slow is Beautiful –Cecile Andrews
7. J C Kumarappa “Economy of Permanence”
8. Pandit Sunderlal “Bharat Mein Angreji Raj”
9. Dharampal, “Rediscovering India”
10. Mohandas K. Gandhi, “Hind Swaraj or Indian Home Rule”
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland (English)

Dr.B.Vishali
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna Rao
Director
SoET,SPMVV

20MUP01: VOCAL

Credits –3
L:T:P::0:0:3

Course Objectives

1. To impart basic knowledge on Indian classical music
2. Description of basic systematic traditional training in carnatic music.
3. Training of voice culture is necessary for a student to learn music properly

Course Outcomes

After successful completion of course the student should be able to

CO1. Learn higher standards of classical music after the course designed.

CO2. Perform sulabha kirtanas on the stage with the strengthen ferum the course designed.

CO3. Through music, students learn team work Focus, and improvisational skills. Music awakens new perceptions in students which help them learn and think in new ways.

LEVEL - I

THEORY:

UNIT-I: Basic knowledge of the following technical terms:

1. Sangita	2. Sruti	3. Swara	4. Saptaswaras
5. Swarasthanas	6. Arohana	7. Avarohana	8. Sthayi
9. Dhatu	10. Matu	11. Avarta	12. Trikala
13.Tala	14. Shadangas	15. SaptaTalas	16. Jati
17.Tauryatrikam	18. Nada	19. Murchana	20. Raga
21.Abhyasagana	22. Sabhagana	23.Vaggeyakara	

UNIT-II: Rachana Laskshanas

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

1. Gita 2. Laskhana Gita 3. Swarapallavi

UNIT-III: Life histories and contribution of the following composers

1. Purandara Dasa 2. Paidala Gurumurti Sastri

UNIT-IV: Tala

1. Schema of 3– 5 Talas2. Tala Dasapranas – any 5

UNIT-V: Raga lakshanas

1. Mayamalavagaula 2. Malahari 3. Mohana
4. Kalyani 5. Sankarabharanam

PRACTICAL

1. Saraliswaras……	8
2. Jantaswaras…….	6
3. Datuswaras…….	2
4. HetchuSthayiswaras……	1
5. TagguSthayiswaras……..	1
6. Alankaras……...	7
7. Gitas	
a. Sri Gananatha……...	Malahari
b. Varavina……....	Mohana
c. Kundagowra…….	Malahari
d. Keraya Neeranu ……..	Malahari
e. Padumanabha……...	Malahari

LEVEL II

THEORY:

UNIT-I: Technical Terms

1. Gandharvam	2. Bharatam	3. Kalpita Sangitam	4. Manodharama Sangitam
5. Gamakam	6. Varjya	7. Vakra	8. Upanga
9. Bhashanga	10. Sampurna	11. Shadava	12. Audava
13. Dvadasasvarasthana	-Shodasa Names		

UNIT-II:

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

1. Raga Tryodasalakshanas
2. Raga Lakshanas

a. Kambhoji b. Hamsadhavani c. Vasanta
d. Saveri

UNIT-III: Rachana Lakshanas

1. Swarajati 2. Varnam

UNIT-IV: Life histories and contribution of

1. Vina Kuppayyar 2. Thiruvottiyur Tyagayyar 3. Patnam Subramanya Iyer

PRACTICAL

1. Swarajati Anyone

2.Varnam:

a. Ninnukori – Mohana – Adi

3. Kritis:

a. Sri Gananatham	Bhajare –	Isamanohari – Roopaka	Muttuswamy Dikshitar
b. Bhadrachala Ramadasu	----------	– Anyone	
c. Annamayya	----------	– Anyone	

LEVEL III

THEORY:

UNIT-I: Raga classifications

1. Janaka-Janya ragas 2. Upanga, Bhashanga ragas
3. 72 Melakartas 4. Vivadi melas

UNIT-II: Talas

1. Desadi, madhyadi Talas 2. Chapu Talas 3. Tala Dasapranas -5

UNIT-III: Raga Lakshanas

1. Suddha Saveri 2. Kedaram 3. Pantuvarali

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
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4. Jaganmohini 5. Madhyamavati 6. Nadanamakriya

UNIT-IV: Rachana Lakshanas

1. Kriti 2. Kirtana

UNIT-V: Life histories and contribution of Vaggeyakaras

1. Tyagarajaswamy 2. Muthuswamy Dikshitar 3. Syamasastry
4. Bhadrachala Ramadasa 5. Annamacharya

PRACTICAL

I. Varnam: (Need to be sung in two speeds)

a. Jalajakshi…… Hamsadhwani…… Adi

II. Kritis:

Mahaganapatim……..	Nata…….	Adi…….	Muttuswamy Dikshitar
Kalaharanamelara …..	Suddha Saveri	Rupaka	Tyagarajaswamy
Brochervarevare	Sriranjani ……	Adi ……..	Tyagarajaswamy
Sobhillu …….	Jaganmohini ….	Rupakam ……..	Tyagarajaswamy
Annamacharya kirtana	……	any one	

LEVEL IV

THEORY:

UNIT-I: Technical Terms

1. Vadi 2. Samvadi 3. Vivadi
4. Anuvadi 5. Muktayi

UNIT-II: Raga Lakshanas

1. Bhairavi 2. Vasanta 3. Kharaharapriya
4. Arabhi 5. Sri

UNIT-III: Rachana Lakshanas

1. Ashtapadi 2. Tillana 3. Tarangam
4. Javali 5. Padam

UNIT-IV: Life histories and contribution of Vaggeyakaras

1. Kshetrayya 2. Pachchimiriyam Adi Appayya 3. Narayana Tirtha

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

4. Jayadeva 5. Sadasiva Brahmendra

PRACTICAL

1. **Kritis:**

Rama nine ……	Mohana ……	Adi……..	Tyagarajaswamy
Vatapi ……	Hamsadhvani ……	Adi ……	Muttuswamy Dikshitar
Sitamma mayamma …..	Vasanta …….	Rupakam ……..	Tyagarajaswamy
Mayatitasvarupini ……	Mayamalavagaula..	Rupakam ……..	Ponnya Pillai
Endaromahanubhavulu...	Sri ……	Adi ……	Tyagarajaswamy

2. **Other Compositions:**

Pasyati …….	Ashtpadi …	Jayadeva		
Nilameghasarira ….	Tarangam..	Mohana …	Adi …	NarayanaTirtha

Javali ……	Anyone
Tillana ……	Anyone

3. **Ragaalapana and swarakalpana in mohana raga only**

Dr.B.Vishali
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna Rao
Director
SoET,SPMVV

20MUP02: BHARATANATYAM

Credits –3
L:T:P::0:0:3

Course Objectives

1. To inculcate basic knowledge on Indian classical dance (Bharatanatyam)
2. Description of South and North Indian Classical Dances
3. Explanation of technical terms in dance
4. Warm up exercise necessary for a student to enable the body limbs to get prepared for learning dance.
5. The important dance items are alaruppu, jathiswarm, kautavam. Pushpanjali, keertanam, and thillana, which were learn the students in this steam.

Course Outcomes

After successful completion of course the student should be able to

CO1. The students of dance will be well trained to learn higher standards of classical dance after the course, designed.

CO2. The students will be able to perform small dance items on stage with the strength forum the course designed

CO3. Through dance, students learn team work Focus, and improvisational skills.
Dance awakens new perceptions in students which help them learn and think in new ways.

LEVEL - I

1.1 THEORY:

1. Origin of Dance as per Bharata'sNatya Sastra
2. Various forms of Indian Classical Dances and their places of origin
3. Definition of the following Technical Terms:

a. Nritta	b.Nritya
c. Natya	d.Tandava
e. Lasya	f. Adavu
g. Abhinaya	h.Kinkini

4. Anga, Pratyanga and Upanga as per Nandhikeswara'sAbhinayaDarpanam
5. AsamyuthaHastasand SamyuthaHastas as per AbhinayaDarpana
6. Meaning of the term Bharatanatyam (Bhava + Raga + Tala)

1.1 PRACTICAL: (Practicum Fundamental)

1. Namaskaram ,Warm ups: Body flexibility exercise

2. Demonstration of the bellowmentioned Adavus (steps)in all 3 speeds

a. Thattadavu	:	Teiyatei
b. Nattadavu	:	Tei yumtat ta
c. ParavalAdavu	:	Taateiteitaa:diteiteitaa
d. Jaaradavu	:	Teiyaa – Teihi
e.Tattakudittamettadavu	:	Tat tei-taaha
f. Kudittamettadavu	:	Teihat tei hi
g. TeermanaAdavu	:	Gin na tom
h.Tattimettu	:	(Chaturasra)

LEVEL – II

2.1 THEORY:

1. Viniyogas(Usages) of AsamyutaHastas as per AbhinayaDarpana
2. Siro Bhedas, DristiBhedas and GrivaBhedas as per AbhinayaDarpana
3. Short notes on:
   a. Natyakrama b. Paatraprana

   c. PaatraLakshana d. Sabha Lakshnana

4. Definitions of the term – Chari, Mandala, Sthaanaka, Bhramari and Utplavana
5. Basic information about Bharatanatyam
   - Meaning of the term
   - Place of origin
   - Important features of the technique

6. Description of the Alaripu,Pushpanjali and Kouthvam

2.2 PRACTICAL: (Introductory Items)

Clear demonstration of minimum 3 steps in the below mentioned groups in all 3 speeds:

1. Advanced Level Adavus:

a. SarikkalAdavu
b. KattiAdavu
c. MandiAdavu

2. Alaripu – TisraEkam

LEVEL - III

3.1 THEORY

1. Viniyogas (Usages) of SamyutaHastas as per AbhinayaDarpana
2. Description of various Indian Classical Dance forms
3. Brief description of Chaturvidhabhinayas
4. Navarasas
5. Definitions:
    a. Tala
    b. Matra
    c. Laya
    d. Avarta
    e. Anga
6. Description of Keertanam and Bajan

3.2 PRACTICAL: (Pre Advanced Practicum)

1. Pushpanjali/Kowthwam
2. Annamacharyakeerthanam

LEVEL – IV

4.1 THEORY:

1. NrittaHastas, DevataHastas as per AbhinayaDarpana
2. DashavataraHastas, BhandhavyaHastas as per AbhinayaDarpana
3. Names and description of AshtavidhaNayikas
4. Biographies of – Chinnaiah, Ponnaiah, Vadivelu, Sivanandham, &Annamacharya
5. Description of Keerthanam and Thillana
6. Contribution of the Gurus to Bharatanatyam :
    a. RukminideviArundale
    b. Balasaraswati
    c. E. Krishna Iyer

4.2 PRACTICAL: (Advanced Practicum)

1. Keerthanam
2. Thillana

Dr.B.Vishali
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna Rao
Director
SoET,SPMVV

20MUP03: KUCHUPUDI

Credits –3
L:T:P::0:0:3

Course Objectives

1. This level introduces the students to the basics of Kuchipudi like many other Indian Dance forms Kuchipudi follows a pattern that includes discipline and helps the students, master the art form.
2. Warm up exercise is necessary for a student to enable the body limbs to get prepared for learning Dance.
3. The stretching exercise helps to build strength in the Knees, Thighs and Calf muscles.
4. They also helps in building body agility.

Course Outcomes

After successful completion of course

CO1. The student can able to do choreography for some songs

CO2. They can able to do further related courses after completing of this course.

CO3. They can able to identify the different dance forms.

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

LEVEL –I

1.1 THEORY

1. Origin of Dance according to Bharata's Natya sastra.
2. Technical Terms
    a. Natya
    b. Nritta
    c. Nrithya
    d. Lasya
    e. Thandava
3. Kinkini, Sabha
4. Siro Bhedas

1.2 PRACTICAL

1. Natya Aramba slokam
2. Bending exercise
3. Pada Bhedas
4. Adugulu: The first level of steps consise of 20 steps.

LEVEL -II

2.1 THEORY

1. Asamyutha Hasthas
2. Drishti Bhedas
3. Dwadasa hastha Pranas
4. Saptha thalas

2.2 PRACTICALS

1. Guru Brahma (Abhinaya for sloka)
2. Angikam (Abhinaya for sloka)
3. Adugulu- The second level of steps consice to 20 steps.
4. Jathi Introduction.

LEVEL –III

3.1 THEORY

1. Samyutha Hasthas
2. Indian classical Dance forms
3. Biography of Siddendra yogi
4. Kuchipudi Natya Trayam

3.2 PRACTICAL

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

1. Kowthvam
2. keerthanam

LEVEL -IV

4.1 THEORY

1. Nava Rasas
2. Nayaki
3. Nayaka
4. Description of Tarangam

4.2 PRACTICAL

1. Bramhanjali
2. Tarangam

20MBST01: RESEARCH METHODOLOGY AND IPR

Credits – 2 **Sessional Marks: 30**
L: T: P:: 2:0:0 **University Exam Marks: 70**

Course Objectives

1. To gain familiarity in order to obtain insights into selected area of research.
2. To acquaint procedures and techniques used to find the results of a research problem.
3. To familiarize methods for data analysis and design.
4. To know the steps to collect information about IPR.
5. To implement IPR protection strategies and other facilities provided by R &D in case of new innovation.

Course Outcomes

After successful completion of course the student should be able to

CO1. Understand the research problem formulation

CO2. Analyze research related information

CO3. Follow research ethics

CO4. Understand that today's world is controlled by computer, information technology but tomorrow world will be ruled by ideas, concept and creativity.

CO5. Understand that when IPR would take such important place in growth of individuals and nation, it is needless to emphasise the need of information about intellectual property rights to be promoted among students in general and engineering in particular.

CO6. Understand that IPR protection provides an incentive to inventors for further research work and investment in R&D, which leads to creation of new and better products, and intern brings about economic growth and social benefits.

UNIT I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

UNIT II

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

UNIT III

Design and Analysis of Experiments: Introduction to ANOVA with examples; Factorial design: 2^n design; Taguchi method: Introduction and application of taguchi method for optimization of process.

UNIT IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT

UNIT V

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology, Patent information and databases, Geographical Indications

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc, Traditional knowledge Case Studies, IPR and IITs.

Text Book

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science & engineering students”.

Reference Books

1. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction”
2. Ranjit Kumar, “Research Methodology: A Step by Step Guide for beginners”, 2 nd Edition
3. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
4. Mayall, “Industrial Design”, McGraw Hill, 1992.
5. Niebel, “Product Design”, McGraw Hill, 1974.
6. Asimov, “Introduction to Design”, Prentice Hall, 1962.
7. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”, 2016.
8. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

20MBST02: ENGLISH FOR RESEARCH PAPER WRITING

Credits – 3 **Sessional Marks: 30**
L: T: P:: 3:0:0 **University Exam Marks: 70**

Course Objectives

1. To acquire the skills needed to write good quality of paper at very first-time submission
2. To design proposals, summaries and essays in a balanced, accurate and effective manner.

Course Outcomes

After successful completion of course the student should be able to

CO1. Examine complex legal texts, Summarize information and reconstruct arguments in a coherent presentation.

CO2. Produce organized and coherent communications and essays with clear paragraphs and appropriate methods for introducing and concluding.

CO3. Write proposals, critical analyzes, summaries and respond appropriately to case reviews/studies.

UNIT I

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, and Introduction.

UNIT III

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

UNIT IV

Key skills needed when writing a Title, key skills needed when writing an Abstract, key skills needed when writing an Introduction, skills needed when writing a Review of the Literature

UNIT V

Skills needed when writing the Methods, skills needed when writing the Results, skills needed when writing the Discussion, skills needed when writing the Conclusions, useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Reference Books

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book .
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

20MBST03: BUSINESS ANALYTICS

Credits - 3 **Sessional Marks: 30**
L: T: P :: 3:0:0 **University Exam Marks: 70**

Course Objectives

1. Basic commands of R.
2. Chi-sqare, ANOVA, Co-variance, Binomial, Poisson & Normal distribution.
3. Charts, Visual Perception, data mugging, sampling etc.
4. Prediction Analysis, Clustering, Decision tree, Machine learning, Neural networks etc.

Course Outcomes

After successful completion of course the student should be able to
CO1. Understand the usage in R
CO2. Analyze probability distribution

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

CO3. Follow grammar for graphics

CO4. Understand that the relationship of variables through Co-variance, Chi-square & ANOVA

CO5. Understand forecasting techniques

UNIT I

Introduction to R : Basic commands of R using R console and R studio, Data structures using R, Descriptive Statistics: Measure of Central Tendency and Measure of Dispersion, Binomial, Poisson and Normal Distribution, Chi-square test, ANOVA and Co-variance.

UNIT II

Data Visualization for Managers: Visualization Imperative – Message to Charts – Visual Perception – Grammar for Graphics (using R) – Component level design of tables and graphs – Storytelling using Visualization.

UNIT III

Exploratory Data Analysis: Data mugging / scraping/ sampling/ cleaning – handling big data – automation of data analytics solutions – Non-linear optimization models.

UNIT IV

Data Analytics: Best practices in data analytics and business intelligence – Prediction Analysis - Clustering – Decision tree – Machine learning - Neural networks – Associations / market basket analysis – Text Mining using R.

UNIT V

Forecasting Techniques: Qualitative and Judgemental Forecasting, Statistical Forecasting, models, forecasting models for stationary Time Series, Forecasting Models for Time Series with a Linear Trend. Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables. Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation using Analytic Solver Platform, New-product development model, Newsvendor modes, overbooking model, Cash budget model – Customer management model – Marketing Mix Model.

Reference Books

1. R.N.Prasad and Seema Acharya,"Fundamentals of Business Analytics"
2. Arben Asllani "Business Analytics with Management Science Models and Methods "First Edition
3. Umesh Apress "Business Analytics Using R - A Practical Approach".

Dr.B.Vishali Rao
Coordinator,Dept.of BS&H
SoET,SPMVV

Prof.A.Ramakrishna
Director
SoET,SPMVV

4. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, "Business analytics Principles, Concepts, and Applications" Pearson FT Press.
5. James Evans," Business Analytics", persons Education.

20BSTH01: ADVANCED ENGINEERING MATHEMATICS

Credits - 4 **Sessional Marks: 30**

L: T: P :: 3:1:0 **University Exam Marks:70**

Course Objectives

1. To understand the basic results in Linear Algebra using appropriate techniques such as Linear dependence and independence of Vectors, Basis and dimension of a Vector Space, properties of Eigen values and Eigen vectors.
2. To evaluate the Bessel functions, Legendre polynomials which helps the students to solve many engineering and physical problems.
3. To equip students with the concepts of Partial differential equations and how to solve non linear Partial differential equations with different methods.

4. To study the fundamental concepts like random variables, probability distributions, sampling.
5. To understand the concept of complex functions, analytic functions, Cauchy's Residue theorem and Laurent's theorem which play a vital role in several engineering problems.

Course Outcomes

After successful completion of the course, the students will be able to

CO1. Describe the concept of a Basis for a Vector Space.
CO2. Apply Orthogonal transformation to a Quadratic form
CO3. Apply techniques to find solutions of Partial differential equations .
CO4. Perform operations with Legendre's polynomial, Generating functions and Bessel's function with their differential equations along with the corresponding recurrence formulas.
CO5. Derive the probability density function of random variables and use these techniques to generate data for various distributions.
CO6. Obtain adequate knowledge on the concepts of analytic functions, Cauchy Integral theorem, Cauchy Residue theorem and Laurent's series to tackle engineering problems.

UNIT I

LINEAR ALGEBRA: Vector space, Basis, System of Linear equations, Linear Dependence and independence, Eigen values and Eigen vectors, Quadratic Forms.

UNIT II

SPECIAL FUNCTIONS: Legendre's Linear Differential Equations, Legendre's function of first kind $P_n(x)$, Legendre's function of second kind $Q_n(x)$, Legendre's polynomials, Generating functions, Recurrence relations, Bessel functions.

UNIT III

PARTIAL DIFFERENTIAL EQUATIONS: Lagrange's Partial Differential equations, Partial Differential equations nonlinear in p and q, Charpits method, Cauchy's method of characteristics.

UNIT IV

PROBABILITY: Random variables conditional probability, Baye's Theorem, Binomial Distribution, Poisson Distribution, Normal Distribution, Mean, Median, Mode and Standard deviation, Joint conditional distribution.

UNIT V

COMPLEX VARIABLES: Analytic functions, Cauchy-Reimann equations, Cauchy's Integral theorem, Cauchy's Integral formula, Cauchy's Residue theorem, Taylor's and Laurent's series.

Text books:

- Grewal, B.S. Higher Engineering Mathematics, Khanna Publishers, 42nd Edition.

Reference Books:

- T.K.V.Iyengar & B.Krishna Gandhi et., Engineering Mathematics – I, II, III; S. Chand & Company.
- T.K.V.Iyengar & B.Krishna Gandhi et. al, "Probability and Statistics", S. Chand & Company, Vol.III.
- Irwin Miller, John E.Freund, "Probability and Statistics for Engineers", Pearson Global edition, 9 th edition.
- S C Gupta and V.K.Kapoor,"Fundamentals of Mathematical Statistics", S. Chand & Son's, 10 th edition 2000.
- Shahnaz Bathul,"A text book of Probability and Statistics", Ridge Publications, 2nd edition.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H			M	L							
CO2	H			M	L							
CO3	M			H	L							
CO4	H	M		L								
CO5	H	L		M								
CO6	M	L		H								

20BSS01 EFFECTIVE COMMUNICATION SKILLS

Credits - 2 **Sessional Marks:40**

L:T:P::0:1:2 **University Exam Marks:60**

Course Objectives

- To enhance speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- To write well structured paragraphs on specific topics.
- To improve the fluency in spoken English and neutralize mother tongue influence.
- To train students to use language appropriately for interview skills, group discussion and public speaking

Course Outcomes

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- Understand verbal and non-verbal communication and become efficient in formal/informal conversations
- Applying presentation & Interview skills for their personal and professional growth.
- Implementing skills and master their Interpersonal skills.
- Transmitting the abilities of Debates and Group discussion for better performance in professional life.

UNIT- I

Introduction to Communication Skills

- Introducing oneself - Introducing others – Greetings
- Role play/Situational Dialogues
- Just A Minute (JAM)

UNIT – II

Soft Skills

- Intrapersonal Skills :
  Time Management, Positive Thinking & Goal Setting
- Interpersonal Skills :
  Leadership Skills, Team Building & Crisis Management

UNIT – III

Writing Skills

- Technical Report Writing
- Resume Writing
- Email Writing

UNIT – IV

Presentation Skills

- Oral Presentations
- Power Point Presentation
- Non- verbal Communication Skills

UNIT – V

Career Skills

- Group Discussions
- Debates

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- Interview Skills
- FAQs & Quick tips

MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcomes	**Program Outcome**											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1		**H**								**M**		**L**
CO2			***L***	**M**		***H***						**M**
CO3									**M**	**H**		***M***
CO4				**M**						***H***		***M***

H = Highly Related; M = Medium L = Low

REFERENCE BOOKS:

1. Soft Skills, revised 2nd edition, K.Alex, S.Chand &Company, New Delhi.2014.
2. Effective Technical Communication | 2nd Edition Paperback, M Ashraf Rizvi, McGraw Hill Education. 2017.
3. Speaking English Effectively, 2nd Edition Krishna Mohan & NP Singh, 2011. (Mcmillan).
4. A Hand book for English language skills, E.Suresh kumar, P.Sreehari, Foundation Books,2011
5. Basics of Communication in English, Soundararaj, Francis. 2012.. *New Delhi: Macmillan*
6. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.

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