DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY UTTAR PRADESH, LUCKNOW

EVALUATION SCHEME & SYLLABUS FOR

B.Tech. (8th Semester)
OPEN ELECTIVES- III & IV

AS PER

AICTE MODEL CURRICULUM & NEP2020
[Effective from the Session: 2025-26]

Note:

1. The Student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during the degree programme.
2. ** It is mandatory that for these subjects (BOE090, BOE100 & BOE101) only Trained Faculty (who had done the FDP for these courses) will teach the courses.

B. TECH. 8th Semester (2025-26)
OPEN ELECTIVE –III

BOE081	FUNDAMENTALS OF DRONE TECHNOLOGY
BOE082	CLOUD COMPUTING
BOE083	BIO MEDICAL SIGNAL PROCESSING
BOE084	ENTREPRENEURSHIP DEVELOPMENT
BOE085	INTRODUCTION TO SMART GRID
BOE086	QUALITY MANAGEMENT
BOE087	INDUSTRIAL OPTIMIZATION TECHNIQUES
BOE088	VIROLOGY
BOE089	NATURAL LANGUAGE PROCESSING
BOE090	**HUMAN VALUES IN MADHYASTH DARSHAN
BOE091	BIM FOR SUSTAINABLE BUILDING PLANNING

OPEN ELECTIVE –IV

BOE092	ELECTRIC VEHICLES
BOE093	AUTOMATION AND ROBOTICS
BOE094	COMPUTERIZED PROCESS CONTROL
BOE095	DATA WAREHOUSING & DATA MINING
BOE096	DIGITAL AND SOCIAL MEDIA MARBETING
BOE097	MODELING OF FIELD-EFFECT NANO DEVICES
BOE098	MODELLING AND SIMULATION OF DYNAMIC SYSTEMS
BOE099	BIG DATA
BOE100	**HUMAN VALUES IN BUDDHA AND JAIN DARSHAN
BOE101	**HUMAN VALUES IN VEDIC DARSANA
BOE102	BUILDING SERVICES INSTALLATION, SAFETY & PRACTICES

OPEN ELECTIVE –III

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BOE090	**HUMAN VALUES IN MADHYASTH DARSHAN
BOE091	BIM FOR SUSTAINABLE BUILDING PLANNING

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BOE081: FUNDAMENTALS OF DRONE TECHNOLOGY

The course is an introduction to flight dynamics and control of aerial vehicles such as drones, UAVs and other such aircrafts, and the current development in the field. It is suitable for graduate and post graduate level with the following course objectives and outcomes.

Eligible Branch: Electronics & Communication, Instrumentation, Aeronautical, Electrical Engineering & Allied Branch, Mechanical, Computer Science & other allied relevant branches.

COURSE OBJECTIVES: The course should enable the students to:

1. To make the students to understand the basic concepts of UAV drone systems.
2. To introduce the stability and control of an aircraft

	DETAILED SYLLABUS	**3-1-0**
Unit	Topic	Proposed Lecture
I	Introduction to Drones: Introduction to Unmanned Aircraft Systems, History of UAV drones, classification of drones, System Composition, applications.	08
II	Design of UAV Drone Systems: Introduction to Design and Selection of the System, Aerodynamics and Airframe Configurations, Characteristics of Aircraft Types, Design Standards and Regulatory Aspects-India Specific, Design for Stealth.	08
III	Avionics Hardware of Drones: Autopilot, AGL-pressure sensorsservos-accelerometer –gyros-actuators- power supply-processor, integration, installation, configuration.	08
IV	Communication, Payloads and Controls: Payloads, Telemetry, Tracking, controls-PID feedback, radio control frequency range, modems, memory system, simulation, ground test-analysis-trouble shooting.	08
V	Navigation and Testing: Waypoints navigation, ground control software, System Ground Testing, System In-flight Testing, Future Prospects and Challenges	08

COURSE OUTCOMES: The student should able to:

1. Ability to design UAV drone system
2. To understand working of different types of engines and its area of applications.

3. To understand static and dynamic stability dynamic instability and control concepts
4. To know the loads taken by aircraft and type of construction and also construction materials in them.

Text Books:

1. Reg Austin “Unmanned Aircraft Systems UAV design, development and deployment”, Wiley, 2010.
2. Robert C. Nelson, Flight Stability and Automatic Control, McGraw-Hill, Inc, 1998.
3. Kimon P. Valavanis, “Advances in Unmanned Aerial Vehicles: State of the Art and the Road to Autonomy”, Springer, 2007
4. Paul G Fahlstrom, Thomas J Gleason, “Introduction to UAV Systems”, UAV Systems, Inc, 1998
5. Dr. Armand J. Chaput, “Design of Unmanned Air Vehicle Systems”, Lockheed Martin Aeronautics.

	BOE082: CLOUD COMPUTING	
	DETAILED SYLLABUS	**3-1-0**
Unit	Topic	Proposed Lecture
I	Introduction: Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed, History of Cloud Computing - Cloud Architecture - Types of Clouds - Business models around Clouds – Major Players in Cloud Computing- issues in Clouds - Eucalyptus - Nimbus - Open Nebula, CloudSim.	08
II	Cloud Services: Types of Cloud services: Software as a ServicePlatform as a Service –Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services. Service providers- Google, Amazon, Microsoft Azure, IBM, Sales force.	08
III	Collaborating Using Cloud Services: Email Communication over the Cloud - CRM Management – Project Management-Event Management - Task Management – Calendar - Schedules - Word Processing – Presentation – Spreadsheet - Databases – Desktop - Social Networks and Groupware.	08
IV	Virtualization for Cloud: Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – System VM, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - supervisors – Xen, KVM, VMware, Virtual Box, Hyper-V.	08
V	Security, Standards and Applications: Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud. Hadoop – MapReduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine	08

Text Books:

1. David E.Y. Sarna, “Implementing and Developing Cloud Application”, CRC press 2011.
2. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.
3. Anthony T Velte, Toby J Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, McGrawHill 2010.
4. Haley Beard, “Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs”, Emereo Pty Limited, July 2008.

	BOE083: BIOMEDICAL SIGNAL PROCESSING	
	DETAILED SYLLABUS	**3-1-0**
Unit	Topic	Proposed Lecture
I	Introduction to Bio-Medical Signals: Classification, Acquisition and Difficulties during Acquisition. Basics of Electrocardiography, Electroencephalography, Electromyography & electro-retinography Role of Computers in the Analysis, Processing, Monitoring & Control and image reconstruction in bio-medical field.	08
II	ECG: Measurement of Amplitude and Time Intervals, QRS Detection (Different Methods), ST Segment Analysis, Removal of Baseline Wander and Power line Interferences, Arrhythmia Analysis, Portable Arrhythmia Monitors.	08
III	Data Reduction: Turning Point algorithm, AZTEC Algorithm, Fan Algorithm, Huffman and Modified Huffman Coding, Run Length. Coding.	08
IV	EEG: Neurological Signal Processing, EEG characteristic, linear prediction theory, Sleep EEG, Dynamics of Sleep/Wake transition. Study of pattern of brain waves, Epilepsy-Transition, detection and Estimation. EEG Analysis By Spectral Estimation: The Bt Method, Periodogram, Maximum Entropy Method & AR Method, Moving Average Method. The ARMA Methods, Maximum Likelihood Method.	08
V	EP Estimation: by Signal Averaging, Adaptive Filtering:- General Structures of Adaptive filters, LMS Adaptive Filter, Adaptive Noise Cancelling, Wavelet Detection:- Introduction, Detection By Structural features, Matched Filtering, Adaptive Wavelet Detection, Detection of Overlapping Wavelets.	08

Text Books:

1. Willis J. Tomkin, “Biomedical Digital Signal Processing”, PHI.
2. D. C. Reddy, “Biomedical Signal Processing”, McGraw Hill
3. Crommwell Weibel and Pfeifer, “Biomedical Instrumentation and Measurement”, PHI

Reference Books:

1. Arnon Cohen, “Biomedical Signal Processing (volume-I)”, Licrc Press\
2. Rangaraj M. Rangayyan, “Biomedical Signal Analysis A Case Study Approach”, John Wiley and Sons Inc.

3. John G. Webster, “Medical instrumentation Application and Design”, John Wiley & Sons Inc

	BOE084: ENTREPRENEURSHIP DEVELOPMENT	
	DETAILED SYLLABUS	**3-1-0**
Unit	Topic	Proposed Lecture
I	Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.	08
II	Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.	08
III	Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.	08
IV	Project Planning and control: The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.	08
V	Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.	08

Text Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India

	BOE085: INTRODUCTION TO SMART GRID	
	DETAILED SYLLABUS	**3-1-0**
Unit	Topic	Proposed Lecture
I	Introduction: Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self Healing Grid, Present development & International policies in Smart Grid. Case study of Smart Grid. CDM opportunities in Smart Grid.	08
II	Smart Grid Technologies: Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading (AMR), Outage Management System (OMS), Plug in Hybrid Electric Vehicles (PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation.	08
III	Smart Grid Technologies: Smart Substations, Substation Automation, Feeder Automation, Geographic Information System (GIS), Intelligent Electronic Devices (IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System (WAMS), Phase Measurement Unit (PMU), PMUs application to monitoring & control of power system.	08
IV	Microgrids and Distributed Energy Resources: Concept of microgrid, need & application of microgrid, formation of microgrid, Issues of interconnection, protection & control of microgrid, Plastic & Organic solar cells, thin flim solar cells, Variable speed wind generators, fuel cells, microturbines, Captive power plants, Integration of renewable energy sources.	08
V	Power Quality Management in Smart Grid: Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring	08

Text Books:

1. Ali Keyhani, Mohammad N. Marwali, Min Dai, “Integration of Green and Renewable Energy in Electric Power Systems”, Wiley.
2. Clark W. Gellings, “The Smart Grid: Enabling Energy Efficiency and Demand Response”, CRC Press.
3. Janaka Ekanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, “Smart Grid:
4. Technology and Applications”, Wiley.

5. Jean Claude Sabonnadiere, NouredineHadjsaid, “Smart Grids”, Wiley Blackwell 19.
6. Stuart Borlase, “Smart Grids (Power Engineering)”, CRC Press.

Reference Books:

1. Andres Carvallo, John Cooper, “The Advanced Smart Grid: Edge Power Driving Sustainability”,Artech House Publishers July 2011.
2. James Northcote, Green, Robert G. Wilson “Control and Automation of Electric Power Distribution Systems (Power Engineering)”, CRC Press.
3. MladenKezunovic, Mark G. Adamiak, Alexander P. Apostolov, Jeffrey George Gilbert “SubstationAutomation (Power Electronice and Power Systems)”, Springer
4. R.C. Dugan, Mark F. McGranghan, Surya Santoso, H. Wayne Beaty, “Electrical Power System Quality”, 2nd Edition, McGraw Hill Publication.

	BOE086: QUALITY MANAGEMENT	
	DETAILED SYLLABUS	**3-1-0**
Unit	Topic	Proposed Lecture
I	Quality Concepts: Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. Control on Purchased Product: Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. Manufacturing Quality: Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims.	08
II	Quality Management: Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. Human Factor in quality Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods.	08
III	Control Charts, Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. Attributes of Control Chart, Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts	08
IV	Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.	08
V	ISO-9000 and its concept of Quality Management, ISO 9000 series, Taguchi method, JIT in some details.	08

Text Books:

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill
3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill

BOE087: INDUSTRIAL OPTIMIZATION TECHNIQUES		
DETAILED SYLLABUS		**3-1-0**
Unit	Topic	Proposed Lecture
I	I Linear Programming: Historical development of optimization, engineering application of optimization, formulation of design problems as a mathematical programing problem. Graphical method of solution, Simplex method, Dual Simplex method and its application in engineering. Transportation and Assignment: Introduction, Mathematical formulations, optimal solution of transportation model. Assignment problems: mathematical formulation, solution of Assignment models (Hungarian method), variation of the Assignment problem, the travelling sales man problem and their application in Engineering.	08
II	Sequencing and Network Analysis: Introduction of sequencing, General assumptions, n Jobs through 2 machines, n jobs through 3 machines, n jobs through m machines, 2 jobs through m machines and their applications in Engineering. Network Analysis: Introduction, Network logic (Network or arrow diagram), Rules for drawing network diagrams, time analysis, forward and backward computation CPM and PERT, and their applications in Engineering.	08
III	Theory of Games and Queueing Models: Introduction, 2 person zero sum games, Maximin and minimax principle, game with saddle point and without saddle point, Principle of dominance, Rectangular games, graphical solution of 2xn or mx2 games. Queuing model: Introduction, Application of Queuing model, generalized Poisson queuing model, single server models and multiple channel Queuing modeland their applications in Engineering.	08
IV	Dynamic Programming and Simulation: Introduction Formulation of Dynamic Programming Problem, Dynamic Programming Algorithm, Forward recursions, Capital Budgeting Problem, Cargo-loading Problem. Solution of LPP by DPP Simulation: Introduction, definition and types of simulation, need for Simulation advantage and disadvantage, application of simulation, simulation procedure, Monte Carlo simulation and their applications in Engineering.	08
V	Inventory Control and Replacement Models: Introduction, types of inventories, Inventory cost, Deterministic and probabilistic (nondeterministic) inventory models and their application in engineering. Replacement models: Introduction, definition, Replacement of items that deteriorate, Replacement of items that fail suddenly, Equipment Renewal Problem, Individual and Group Replacement policies & their applications in Engineering	08

Text Books:

1. Singiresu S. Rao. “Engineering Optimization” Theory and Practice”. New Age International, New Delhi.
2. R. Panneerselvam. “Operations Research “. Prentice- Hall of India, New Delhi

3. Eliezer Naddor. “Inventory Systems”. John Wiley & Sons, Inc. New York

Reference Books:

1. H.A. Taha: Operations Research – An Introduction, Macmillan Publishing Company, Inc., New York.
2. K. Swarup, P.K. Gupta, M. Mohan: “Operations Research”, Sultan Chand and Sons, New Delhi.
3. P.K. Gupta, D.S. Hira: “Operations Research” – An Introduction, S. Chand & Company Limited, New Delhi.
4. S.S. Rao: “Optimization Theory and Applications”, Wiley Eastern Ltd., New Delhi.
5. J.K. Sharma: “Operations Research: Theory and Applications”, Mac Millan India

BOE088: VIROLOGY

OBJECTIVE:

The objective of this course is to help the student learn molecular virology by general principles as opposed to describing each virus family. The rules for viral replication that all viruses follow are illustrated and discussed: while pointing out to the specific features of each virus, the course aims to reveal unity in the virus world rather than diversity. Host-pathogen interactions and examples of viral diseases will be discussed, with particular emphasis on the main principles of vaccine and antiviral drug development

DETAILED SYLLABUS		**3-1-0**
Unit	Topic	Proposed Lecture
I	General Concepts: Virus history, Diversity, shapes, sizes and components of genomes. Isolation and purification of viruses and components.	08
II	Consequences of virus infection to animals and human. Viral infection: affect on host macromolecules. Viral infection: establishment of the antiviral state. Viruses counter attack mechanisms. Viral diagnostic techniques: Rapid Antigen testing, RTPCR.	08
III	Classification of viruses and nomenclatures. +strand RNA viruses- Picorna viruses. Flavi viruses- West Nile virus and Dengue virus. Corona viruses- SARS pathogens. Small DNA viruses: parvo- and polyoma viruses. Large DNA viruses: Herpes-adeno-, and poxviruses. Miscellaneous viruses.	08
IV	–ve strand RNA viruses Paramyxo viruses. Orthomyxo viruses: Influenza pathogenesis and Bird flu. Rhabdo viruses: Rabies pathogenesis.. dsRNA viruses- Reo viruses. Retroviruses: structure, classification, life cycle; reverse transcription. Retroviruses: HIV, viral pathogenesis and AIDS.	08
V	Antivirals and viral vaccines Viral Vaccines Conventional vaccines- killed and attenuated, modern vaccinesrecombinant proteins, subunits, DNA vaccines, peptides, immunemodulators (cytokines), vaccine delivery and adjuvants, large scale manufacturing- QA/QC issues. Antivirals Interferons, designing and screening of antivirals, mechanism of action, antiviral libraries, antiretrovirals- mechanism of action and drug resistance. Modern approaches of virus control Anti-sense RNA, siRNA, ribozymes.	08

Reference Books:

1. Antiviral Agents, Vaccines and immunotherapies. Stephen K. Tyring. ISBN 9780367393748 CRC
2. Basic Virology – Edward K Wanger. Blackwell Publication
3. Fundamentals of molecular virology – Acheson and Nicholas H,2011 4. Principles of Virology 2nd edition by S.J.Flint, L.W.Enquist, R.M.Krug,V.R. Racaniello, and A.M.Skalka ASM Press
5. Medical Virology 4th edition by David O.White and Frank J. Fenner. Academic Press.

	BOE089: NATURAL LANGUAGE PROCESSING	
	DETAILED SYLLABUS	**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.	08
II	Introduction to semantics and knowledge representation, some applications like machine translation, database interface.	08
III	Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.	08
IV	Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.	08
V	Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.	08

Text Books:

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, “NLP: A Paninian Perspective”, Prentice Hall, New Delhi.
2. James Allen, “Natural Language Understanding”, Pearson Education.
3. D. Jurafsky, J. H. Martin, “Speech and Language Processing”, Pearson Education.
4. L. M. Ivansca, S. C. Shapiro, “Natural Language Processing and Language Representation”, AAAI Press, 2000.
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley.

	BOE090: HUMAN VALUES IN MADHYASTH DARSHAN	
	DETAILED SYLLABUS	**3-1-0**
Unit	Topic	Proposed Lecture
	Catalogue Description: Madhyasth Darshan is a new emerging philosophy that describes the existential realities along with its implication in behaviour and work at the level of individual as well as society. This philosophy has been propounded by Shri A. Nagraj in seventies. It is to be kept in mind that Darshan means realisation which calls for developing the capacity to see the reality in oneself directly. So, any study of Darshan shall help develop this capacity in the students through proper steps of practices and shall not just provide the information.	08
I	Introduction to Madhyasth Darshan and its Basics Need to study Madhyasth Darshan; introduction, basic formulations of the darshan; the complete expanse of study and the natural outcome of living according to the darshan.	08
II	Submergence of Nature in Space The ever-present existence in the form of nature submerged in space; nature classified into two categories – material and consciousness, and four orders; the form, property, natural characteristic and selforganization of the four orders, General direction and process of evolution in the nature/ existence.	08
III	Human Being as an indivisible part of Nature Human being as an indivisible part of nature; various types (five classes) of human beings; human being in the combination of self and body; purpose of self as realization, prosperity for the body; need of behavior and work for attaining the goals of realization and prosperity	08
IV	Fulfillment of human goal of realization and prosperity Following natural, social and psychological principles for actualizing the human goal; form of conducive society and order for such practices, study process-achieving realization through self-study and practice while living in such a society (social order).	08

V	Human Conduct based on Madhyasth Darshan Description of such a realized self, continuity of happiness, peace, satisfaction and bliss through realization, conduct of a realized human being. Possibility of finding solutions to present day problems (such as inequality of rich and poor, man and woman etc.) in the light of it.	

Text Books:

1. Nagraj, A., "Manav Vyavahar Darshan", Jeevan Vidya Prakashan, 3rd edition, 2003

References:

1. Nagraj, A., "Vyavaharvadi Samajshastra", Jeevan Vidya Prakashan, 2nd edition, 2009.
2. Nagraj, A., "Avartanasheel Arthashastra", Jeevan Vidya Prakashan, 1st edition, 1998.
3. Class notes on "Human Values in Madhyasth Darshan" available on www.uhv.org.in
4. PPTs for "Human Values in Madhyasth Darshan" available on www.uhv.org.in
5. Video lectures on "Human Values in Madhyasth Darshan" on AKTU Digital Education
6. (https://www.youtube.com/watch?v=l4x26FPFJYs&t=1558s)

BOE91: BIM FOR SUSTAINABLE BUILDING PLANNING

Course Objectives

- To introduce BIM-based planning concepts aligned with sustainable, smart, and climate-responsive buildings
- To develop planning-level digital literacy required in modern AEC industry
- To integrate energy, water, solar, and green building concepts at conceptual stage
- To enhance visual decision-making skills without software-intensive training
- To provide industry-relevant understanding for internships and entry-level roles

Course Outcomes

CO	Course Outcome Statement
CO1	Explain BIM concepts and its role in modern planning and coordination
CO2	Apply sustainable and climate-responsive planning principles
CO3	Plan rainwater harvesting and renewable energy systems conceptually
CO4	Apply planning decisions using energy, daylight, and spatial logic
CO5	Interpret traditional planning and Vastu concepts in contemporary planning practice.

Unit–I: BIM in Modern Building Planning 08

Evolution from 2D drafting to digital construction workflows; Concept of Building Information Modelling (BIM); BIM vs CAD information richness and coordination; Role of BIM in conceptual planning & feasibility; Coordination of architecture, structure, MEP (planning level); BIM in government projects, smart cities & infrastructure; Limitations and ethical use of BIM.

Unit–II: Sustainable & Climate-Responsive Planning 08

Principles of sustainable & green building planning; Climate zones of India and planning implications; Orientation for thermal comfort & energy efficiency; Daylighting strategies, glare control; Natural ventilation and passive cooling concepts; Introduction to Life Cycle Thinking (LCT) at planning stage; Planning validation using visual and spatial understanding.

Unit–III: Water-Sensitive Urban & Building Planning 08

Urban water crisis and sustainability challenges; Rainwater harvesting (RWH) systems – planning concepts; Rooftop harvesting and recharge planning; Percolation pits, trenches, recharge wells; Integration of RWH with site layout & landscape; Greywater reuse concepts (planning level only); Maintenance, resilience, and climate adaptability.

Unit–IV: Solar Energy & Energy-Efficient Planning 08

Energy demand trends in buildings; Basics of solar PV and solar thermal systems; On-grid, off-grid & hybrid systems (conceptual); Rooftop solar planning: orientation, shading, access; Energy-efficient envelope concepts; Introduction to net-zero & low-energy buildings; Planning
stage energy decisions and trade-offs.

Unit–V: Traditional Planning, Vastu & Professional Ethics 08

Origin, intent, and cultural context of Vastu Shastra; Functional zoning and orientation concepts; Scientific vs non-scientific Vastu practices; Compatibility of Vastu with modern engineering; Client communication using visual planning tools; Ethical responsibility of engineers in planning decisions; Addressing myths, sustainability, and inclusivity.

Suggested Textbooks and Reference Books

1. Eastman, C. M., Teicholz, P., Sacks, R., & Liston, K. *BIM Handbook: A Guide to Building Information Modeling*. Wiley.
2. Garde, S. *Building Information Modeling, BIM Fundamentals and Methods*. Indian Edition.
3. Dhillon, B. S. *BIM: Digital Transformation for the AEC Industry*. Indian Edition.
4. Shera, H. S., & Rathore, S. S. *Building Information Modeling: A Practical Approach*.
5. Kibert, C. J. *Sustainable Construction: Green Building Design and Delivery*. Wiley.
6. Ching, F. D. K., & Shapiro, I. M. *Green Building Illustrated*. Wiley.
7. Singla, S. *Sustainable Construction, Principles and Practice*. Indian Edition.
8. Kumar, R. *Green Building and Sustainable Engineering*.
9. Krishan, A. *Climate Responsive Architecture: Design Handbook*.
10. Day, C. *Passive Solar Design and Construction*.
11. Peake, S. *Renewable Energy: Power for a Sustainable Future*. Oxford University Press.
12. Sukhatme, S. P. *Solar Energy: Principles of Thermal Collection and Storage*. Indian Edition.
13. Manickam, R. G. *Rainwater Harvesting and Management*.
14. Babu, B. Niranjan. *Vastu Shastra for Everyone*

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OPEN ELECTIVE –IV SYLLABUS

BOE092	ELECTRIC VEHICLES
BOE093	AUTOMATION AND ROBOTICS
BOE094	COMPUTERIZED PROCESS CONTROL
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BOE102	BUILDING SERVICES INSTALLATION, SAFETY & PRACTICES

** It is mandatory that for these subjects (BOE100 & BOE101) only Trained Faculty (who had done the FDP for these courses) will teach the courses.

BOE092 ELECTRIC VEHICLES		
DETAILED SYLLABUS		**3-1-0**
Unit	Topic	Proposed Lecture
I	Introduction of Electric Vehicles: Concept of Electrified transportation, Past, present status of electric vehicles, Recent developments and trends in electric vehicles, Comparison of EVs and IC Engine vehicles, Understanding electric vehicle components, Basic EV components and architecture, Autonomy and vehicle computing needs.	08
II	Electric Motor Drives for EV applications: Concept of EV motors, Classification of EV motors, Comparison of Electric motors for EV applications, Recent EV motors, BLDC and SRM, axial flux motor. Introduction to power electronics converters, DC-DC converter, speed control of dc motor, BLDC motor driving schemes.	08
III	EV Batteries and Battery Management System: EV batteries, Lead Acid batteries – Basics, Characteristics, Lithium batteries- Basics, Characteristics, Selection of battery for EVs, Smart battery pack design, Mechanical and reliability aspects of Li Ion packs, UN38 regulation familiarity, Cell balancing in Li Ion, Battery second life and usage in BESS (energy storage systems). BMS - Global price trends, volumetric and gravimetric efficiency trends	08
IV	Charging system design technology for EV applications: Charging system design considerations, AC & DC Charging, Charging methods, On-board/Off-board chargers,Vehicle to charger communication system, OCPP familiarity cloud and device side, metrology, billing and authentication types, understand the computing needs in a charging system, Understand internal major block diagrams and subsystems of low and high power chargers. IEC61850 and 61851 familiarities, IEC61000, 60950/51, IEC62196 key highlights.	08
V	EV Charging Facility Planning: Identification of EV demand, Impact of EV charging on power grid, Energy generation scheduling, different power sources, centralized charging schemes, Energy storage integration into micro-grid, Overview and applicability of AI for the EV ecosystem, design of V2G aggregator, case studies.	08

Reference:

1. C.C. Chan, K.T. Chau. Modern Electric Vehicle Technology, Oxford University Press, NY 2001

2. M.Ehsani, Y.Gao, S.E.Gay, A.Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles – Fundamentals, Theory and Design, CRC Press, 2004
3. James Larminie, John Lowry. Electric Vehicle Technology Explained. Wiley 2012
4. NPTEL Course on Electric Vehicles – Part 1 by Dr. Amit Jain, IIT Delhi
5. Tests on Lithium-ion batteries. Available at: https://www.lithium-batterie-service.de/en/un-38.3-testseries
6. Handbook on Battery Energy Storage Systems- ADB, 2018 Addition

Practical Hand (Lab works):

1. BLDC motor control experiment
2. E-rickshaw commercial BLDC and driver based live demo
3. Charge discharge characteristics of Li-Ion batteries and cells
4. BMS function SoC, SoH and cell balancing demo
5. PFC demo and waveform capture
6. LLC (DCDC) demo and waveform capture
7. CV, CC operation
8. Tear down analysis of DC fast charger and AC fast charger

BOE093 AUTOMATION AND ROBOTICS		
DETAILED SYLLABUS		**3-1-0**
Unit	Topic	Proposed Lecture
I	Automation: Definition, Advantages, goals, types, need, laws and principles of Automation. Elements of Automation. Fluid power and its elements, application of fluid power, Pneumatics vs. Hydraulics, benefit and limitations of pneumatics and hydraulics systems, Role of Robotics in Industrial Automation.	08
II	Manufacturing Automation: Classification and type of automatic transfer machines; Automation in part handling and feeding, Analysis of automated flow lines, design of single model, multimode and mixed model production lines. Programmable Manufacturing Automation CNC machine tools, Machining centers, Programmable robots, Robot time estimation in manufacturing operations.	08
III	Robotics: Definition, Classification of Robots - Geometric classification and Control classification, Laws of Robotics, Robot Components, Coordinate Systems, Power Source. Robot anatomy, configuration of robots, joint notation schemes, work volume, manipulator kinematics, position representation, forward and reverse transformations, homogeneous transformations in robot kinematics, D-H notations, kinematics equations, introduction to robot arm dynamics.	08
IV	Robot Drives and Power Transmission Systems: Robot drive mechanisms: Hydraulic/Electric/Pneumatics, servo & stepper motor drives, Mechanical transmission method: Gear transmission, Belt drives, Rollers, chains, Links, Linear to Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearings. Robot end Effectors: Classification of End effectors – active and passive grippers, Tools as end effectors, Drive system for rippers. Mechanical, vacuum and magnetic grippers. Gripper force analysis and gripper design.	08
V	Robot Simulation: Methods of robot programming, Simulation concept, Off-line programming, advantages of offline programming. Robot Applications: Robot applications in manufacturing-Material transfer and machine loading/unloading, Processing operations like Welding & painting, Assembly operations, Inspection automation, Limitation of usage of robots in processing	08

	operation. Robot cell design and control, Robot cell layouts- Multiple robots & Machine interference.	

Text Books:

1. An Introduction to Robot Technology, by Coifet Chirroza, Kogan Page.
2. Robotics for Engineers, by Y. Koren, McGraw Hill.
3. Robotic: Control, Sensing, Vision and Intelligence, by Fu, McGraw Hill.
4. Introduction to Industrial Robotics, by Nagrajan, Pearson India.
5. Robotics, by J.J. Craig, Addison-Wesley.
6. Industrial Robots, by Groover, McGraw Hill.
7. Robotic Engineering - An Integrated Approach : Richard D. Klafter Thomas A.
8. Robots & Manufacturing Automation, by Asfahl, Wiley.

	BOE094 COMPUTERIZED PROCESS CONTROL	
	DETAILED SYLLABUS	**3-1-0**
Unit	Topic	Proposed Lecture
I	Basics of Computer-Aided Process Control: Role of computers in process control, Elements of a computer aided Process control System, Classification of a Computer–Aided Process Control System Computer Aided Process–control Architecture: Centralized Control Systems, Distributed control Systems, Hierarchical Computer control Systems. Economics of Computer-Aided Process control. Benefits of using Computers in a Process control. Process related Interfaces: Analog Interfaces, Digital Interfaces, Pulse Interfaces, Standard Interfaces.	08
II	Industrial communication System: Communication Networking, Industrial communication Systems, Data Transfer Techniques, Computer Aided Process control software, Types of Computer control Process Software, Real Time Operating System.	08
III	Process Modelling for computerized Process control: Process model, Physical model, Control Model, Process modelling. Modelling Procedure: Goals Definition, Information Preparation, Model Formulation, Solution Finding, Results Analysis, Model Validation.	08
IV	Advanced Strategies For Computerised Process control: Cascade Control, Predictive control, Adaptive Control, Inferential control, Intelligent Control, Statistical control.	08
V	Examples of Computerized Process Control: Electric Oven Temperature Control, Reheat Furnace Temperature control, Thickness and Flatness control System for metal Rolling, Computer-Aided control of Electric Power Generation Plant.	08

Text Books:

1. S. K. Singh, “Computer Aided Process control”, PHI.

Reference Books:

1. C. L. Smith, “Digital computer Process Control”, Ident Educational Publishers.
2. C. D. Johnson, “Process Control Instrumentation Technology”, PHI.
3. Krishan Kant, “Computer Based Industrial Control”

4. Pradeep B. Deshpande & Raymond H. Ash, “Element of Computer Process Control with Advance Control Applications”, Instrument Society of America, 1981.
2. C. M. Houpis & G. B. Lamond, “Digital Control System Theory”,McGraw Hill.

BOE095 DATA WAREHOUSING & DATA MINING		
	DETAILED SYLLABUS	**3-1-0**
Unit	Topic	Proposed Lecture
I	Data Warehousing: Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept.	08
II	Data Warehouse Process and Technology: Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design	08
III	Data Mining: Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Pre-processing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree	08
IV	Classification: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method – Statistical Approach, Association rules: Introduction, Large Item sets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	08

V	Data Visualization and Overall Perspective: Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining.	08

Suggested Readings:

1. Alex Berson, Stephen J. Smith “Data Warehousing, Data-Mining & OLAP”, McGrawHil.
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, “Data Warehousing: Architecture and Implementation”, Pearson Education..
3. I. Singh, “Data Mining and Warehousing”, Khanna Publishing House.
4. Margaret H. Dunham, S. Sridhar,”Data Mining:Introductory and Advanced Topics” Pearson Education.

	BOE096: DIGITAL AND SOCIAL MEDIA MARKETING	
	DETAILED SYLLABUS	**3-1-0**
Unit	Topic	Proposed Lecture
I	Introduction to Digital Marketing: The new digital world - trends that are driving shifts from traditional marketing practices to digital marketing practices, the modern digital consumer and new consumer's digital journey. Marketing strategies for the digital world-latest practices.	08
II	Social Media Marketing -Introduction to Blogging, Create a blog post for your project. Include headline, imagery, links and post, Content Planning and writing. Introduction to Face book, Twitter, Google +, LinkedIn, YouTube, Instagram and Pinterest; their channel advertising and campaigns.	08
III	Acquiring & Engaging Users through Digital Channels: Understanding the relationship between content and branding and its impact on sales, search engine marketing, mobile marketing, video marketing, and social-media marketing. Marketing gamification, Online campaign management; using marketing analytic tools to segment, target and position; overview of search engine optimization (SEO).	08
IV	Designing Organization for Digital Success: Digital transformation, digital leadership principles, online P.R. and reputation management. ROI of digital strategies, how digital marketing is adding value to business, and evaluating cost effectiveness of digital strategies.	08
V	Digital Innovation and Trends: The contemporary digital revolution, digital transformation framework; security and privatization issues with digital marketing Understanding trends in digital marketing – Indian and global context, online communities and co-creation.	08

Text Books:

1. Moutsy Maiti: Internet Mareting, Oxford University Press India
2. Vandana, Ahuja; Digital Marketing, Oxford University Press India (November, 2015).
3. Eric Greenberg, and Kates, Alexander; Strategic Digital Marketing: Top Digital Experts
4. Share the Formula for Tangible Returns on Your Marketing Investment; McGraw-Hill Professional.
5. Ryan, Damian; Understanding Digital Marketing: marketing strategies for engaging the digital generation; Kogan Page.

6. Tracy L. Tuten & Michael R. Solomon: Social Media Marketing (Sage Publication)

BOE097 MODELING OF FIELD-EFFECT NANO DEVICES		
DETAILED SYLLABUS		**3-1-0**
Unit	Topic	Proposed Lecture
I	MOSFET scaling, short channel effects - channel engineering - source/drain engineering - high k dielectric - copper interconnects - strain engineering, SOI MOSFET, multigate transistors – single gate – double gate – triple gate – surround gate, quantum effects – volume inversion – mobility – threshold voltage – inter subband scattering, multigate technology – mobility – gate stack.	08
II	MOS Electrostatics – 1D – 2D MOS Electrostatics, MOSFET CurrentVoltage Characteristics – CMOS Technology – Ultimate limits, double gate MOS system – gate voltage effect - semiconductor thickness effect – asymmetry effect – oxide thickness effect – electron tunnel current – two dimensional confinement, scattering – mobility.	08
III	Silicon nanowire MOSFETs – Evaluvation of I-V characteristics – The I-V characteristics for nondegenerate carrier statistics – The I-V characteristics for degenerate carrier statistics – Carbon nanotube – Band structure of carbon nanotube – Band structure of graphene – Physical structure of nanotube – Band structure of nanotube – Carbon nanotube FETs – Carbon nanotube MOSFETs – Schottky barrier carbon nanotube FETs – Electronic conduction in molecules – General model for ballistic nano transistors – MOSFETs with 0D, 1D, and 2D channels – Molecular transistors – Single electron charging – Single electron transistors.	08
IV	Radiation effects in SOI MOSFETs, total ionizing dose effects – single-gate SOI – multi-gate devices, single event effect, scaling effects.	08
V	Digital circuits – impact of device performance on digital circuits – leakage performance trade off – multi VT devices and circuits – SRAM design, analog circuit design – transconductance - intrinsic gain – flicker noise – self heating –band gap voltage reference – operational amplifier – comparator designs, mixed signal – successive approximation DAC, RF circuits.	08

Text Books:

1. J P Colinge, "FINFETs and other multi-gate transistors", Springer – Series on integrated circuits and systems, 2008

2. Mark Lundstrom, Jing Guo, "Nanoscale Transistors: Device Physics, Modeling and Simulation", Springer, 2006
3. M S Lundstorm, "Fundamentals of Carrier Transport", 2nd Ed., Cambridge University Press, Cambridge UK, 2000.

	BOE098 MODELLING AND SIMULATION OF DYNAMIC SYSTEMS	
	DETAILED SYLLABUS	**3-1-0**
Unit	Topic	Proposed Lecture
I	Introduction to modeling and simulation: Introduction to modeling, Examples of models, modeling of dynamic system, Introduction to simulation, MATLAB as a simulation tool, Bond graph modeling, causality, generation of system equations.	08
II	Bond graph modeling of dynamic system: Methods of drawing bond graph model- Mechanical systems & Electrical systems, some basic system models- Mechanical systems, Thermal systems, hydraulic systems, pneumatic systems and electrical systems.	08
III	System models of combined systems: Linearity and non linearity in systems combined rotary and translatory system, electro mechanical system, hydro- mechanical system.	08
IV	Dynamic Response and System Transfer Function: Dynamic response of 1^{st} order system and 2^{nd} order system, performance measures for 2^{nd} order system, system transfer function, transfer function of 1^{st} and 2^{nd} order system Block diagram algebra, signal flow diagram, state variable formulation, frequency response and bode plots.	08
V	Simulation and simulation applications: Simulation using SIMULINK, examples of simulation problems- simple and the compound pendulum, planner mechanisms, validation and verification of the simulation model, parameter estimation methods, system identifications, introduction to optimization.	08

Text Books:

1. Zeigler B.P. Praehofer. H. and Kim I.G. "Theory of modeling and simulation", 2nd Edition. Academic press 2000.
2. Robert L. Woods, Kent L. Lawrence, “Modeling and simulation of dynamic systems”, Person, 1997.
3. Brown, Forbes T. “Engineering System Dynamics”, New York, NY: CRC, 2001. ISBN: 9780824706166.
4. Pratab.R " Getting started with MATLAB" Oxford university Press 2009.

BOE099 BIG DATA		
	DETAILED SYLLABUS	**3-1-0**
Unit	Topic	Proposed Lecture
I	Introduction to Big Data: Types of digital data, history of Big Data innovation, introduction to Big Data platform, drivers for Big Data, Big Data architecture and characteristics, 5 Vs of Big Data, Big Data technology components, Big Data importance and applications, Big Data features – security, compliance, auditing and protection, Big Data privacy and ethics, Big Data Analytics, Challenges of conventional systems, intelligent data analysis, nature of data, analytic processes and tools, analysis vs reporting, modern data analytic tools.	08
II	Hadoop: History of Hadoop, Apache Hadoop, the Hadoop Distributed File System, components of Hadoop, data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, Hadoop Echo System. Map-Reduce: Map-Reduce framework and basics, how Map Reduce works, developing a Map Reduce application, unit tests with MR unit, test data and local tests, anatomy of a Map Reduce job run, failures, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats, Map Reduce features, Real-world Map Reduce	08
III	HDFS (Hadoop Distributed File System): Design of HDFS, HDFS concepts, benefits and challenges, file sizes, block sizes and block abstraction in HDFS, data replication, how does HDFS store, read, and write files, Java interfaces to HDFS, command line interface, Hadoop file system interfaces, data flow, data ingest with Flume and Scoop, Hadoop archives, Hadoop I/O: Compression, serialization, Avro and file-based data structures. Hadoop Environment: Setting up a Hadoop cluster, cluster specification, cluster setup and installation, Hadoop configuration, security in Hadoop, administering Hadoop, HDFS monitoring & maintenance, Hadoop benchmarks, Hadoop in the cloud	08

IV	Hadoop Eco System and YARN: Hadoop ecosystem components, schedulers, fair and capacity, Hadoop 2.0 New Features – Name Node high availability, HDFS federation, MRv2, YARN, Running MRv1 in YARN. NoSQL Databases: Introduction to NoSQL MongoDB: Introduction, data types, creating, updating and deleing documents, querying, introduction to indexing, capped collections Spark: Installing spark, spark applications, jobs, stages and tasks, Resilient Distributed Databases, anatomy of a Spark job run, Spark on YARN SCALA: Introduction, classes and objects, basic types and operators, built-in control structures, functions and closures, inheritance.	08
V	Hadoop Eco System Frameworks: Applications on Big Data using Pig, Hive and HBase Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators, Hive - Apache Hive architecture and installation, Hive shell, Hive services, Hive metastore, comparison with traditional databases, HiveQL, tables, querying data and user defined functions, sorting and aggregating, Map Reduce scripts, joins & subqueries. HBase – Hbase concepts, clients, example, Hbase vs RDBMS, advanced usage, schema design, advance indexing, Zookeeper – how it helps in monitoring a cluster, how to build applications with Zookeeper. IBM Big Data strategy, introduction to Infosphere, BigInsights and Big Sheets, introduction to Big SQL.	08

Suggested Readings:

Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley.

Big-Data Black Book, DT Editorial Services, Wiley.

Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch, “Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill.

Thomas Erl, Wajid Khattak, Paul Buhler, “Big Data Fundamentals: Concepts, Drivers and Techniques”, Prentice Hall.

BOE100 HUMAN VALUES IN BAUDDHA AND JAIN DARSHAN

Bauddha and Jain Darshan form a part of the philosophy of Indian tradition. This course outlines the basic concepts and principles of these two philosophies and provides scope for further reading of the philosophies, so as to gain clarity about the human being, the existence and human participation i.e. human values expressing itself in human conduct.

It is to be kept in mind that Darshan means realization which calls for developing the capacity to see the reality in oneself directly. So, any study of Darshan shall help develop this capacity in the students through proper steps of practices and shall not just provide the information.

DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	Introduction to Bauddha and Jain Darshan and their Basics Need to study Bauddha and Jain Darshan; the origin of the these philosophies, their basic principles and scope for further reading.	08
II	Basic Principles of Bauddha Darshan law of impermanence (changability); four noble truths; eightfold path; law of cause- action (pratitya-samutpaad) Definition of some salient words of Buddha Darshan – nirvana, dhamma, tri- ratna(Buddha, Dharma and Sangh), pragya, karma, parmi, ashta-kalap, trishna, shad-ayatan, samvedana, vipassana, anitya, maitri, brham-vihaar, tathagata, arahant..	08
III	Purpose and Program for a Human Being based on Bauddha Darshan The purpose and program of a human being living on the basis of it, clarity and practice of human values and human conduct, the natural outcome of such a program on society, nature and tradition. Purpose-freedom from suffering, nirvana; root of suffering-vikaar – raga, dvesha and moha, Progam – various steps of meditation for attaining knowledge; shamath and vipassana; sheel- samadhi-pragya; practice of equanimity (samatva), eightfold path(Ashtang Marg); combination of understanding and practice..	08

IV	Basic Principles of Jain Darshan Basic realities – description of nine elements in existence (jeev, ajeev, bandh, punya, paap, aashrav, samvar, nirjara, moksha), 6 dravya of lok – dharma, adhrma, akash, kaal, pudgal, jeev; tri-lakshan, various types of pragya, various stages of realisation; samyak-gyan, samyak- darshan, samyak-charitra, syadvaad, anekantavaad, naya- nishchaya and vyavahar, karma- phal siddhanta Definition of some salient words of Jain Darshan –arhant, jin, tirthankara, panch- parameshthi, atma, pramaan, kaal, pudgal, paramanu, kashay, leshya..	08
V	Purpose and Program for a Human Being based on Jain Darshan The purpose and program of a human being living on the basis of it, clarity and practice of human values and human conduct, the natural outcome of such a program on society, nature and tradition, possibility of finding solutions to present day problems in the light of it. Purpose (goal) - moksha, Program- following mahavrat, anuvrat, 10 lakshan dharma; samyak darshan-gyan-charitra. Commonality with Bauddha Darshan	08

Text Books:

1. Chattejee, S.G. and Datta, D.M., "An Introduction to Indian Philosophy", University of Calcutta Press, 1960.

Reference Books:

1. "Dhammapad", Vipassana Research Institute, 2001.
2. Drukpa, G., "Musings from the Heart", Drukpa Publications Private Ltd, 2018.
3. Jyot, "Ek cheez milegi Wonderful", A Film Directed by Jyot Foundation, 2013.
4. Goenka, S.N., "The Discourse Summaries", Vipassana Research Institute, 1987.
5. Madhavacharya, "Sarva-darshan Samgraha", Chaukhambha Vidya Bhavan, Varanasi, 1984.
6. Varni, J., "Samansuttam", Sarva Seva Sangh Prakashan, Varanasi, 7th Edition, 2010.
7. https://www.youtube.com/watch?v=cz7QHNvNFfA&list=PLPJVlVRVmhc4Z01fD57j bzycm9I6W054x (English)
8. https://www.youtube.com/watch?v=r5bud1ybBDc&list=PLY9hraHvoLQLCkl7Z2DW KMgRAWU77bKFy (Hindi).

BOE101: HUMAN VALUES IN VEDIC DARŚANA		
DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	Introduction to Vedic Darśana and Nyāya Darśana (Philosophy of Indian Logic and Reasoning) Introduction to Vedic literature, need to study Vedic Darśana; its origin and subject matter. Introduction to Nyāya Darśana, 16 padārthas (pramāṇa, prameya, saṃśaya, prayojana, dṛṣṭānta, siddhānta, avayava, tarka, nirṇaya, vāda, jalpa, vitaṇḍā, hetuābhāsa, chala, jāti, nigrahasthāna) paṃcāvayava prakriyā (pratijñā, hetu, udāharaṇa, upanaya, nigamana).	09
II	Vaiśeṣika Darśana (Philosophy of Matter) Introduction to Vaiśeṣika Darśana, definition of Dharma, abhyudaya, niḥśreyasa; 6 padārthas (dravya, guṇa, karma, sāmānya, viśeśa, samavāya) – their definition, characteristics and relationship; nitya-anitya; cause-effect relationships; dṛṣṭa-adṛṣṭa karma phala; mindful dāna; śucitā-aśucitā; reasons of rāga-dveśa, avidyā, sukha-duḥkha, etc. and how to get rid of them.	07
III	Sāṃkhya-Yoga Darśana (Philosophy of Spirituality) Sāṃkhya Darśana- Puruṣārtha, the nature of Puruṣa and Prakṛti, 24 elements of Prakṛti, bondage and salvation (liberation), the principle of satkāryavāda, triguṇātmaka prakṛti.Yoga Darśana- the steps of Aṣṭāṃga yoga (yama, niyama, āsana, prāṇāyāma, pratyāhāra, dhāraṇā, dhyāna and samādhi) and the challenges in following them, afflictions (kleṣa)- avidyā, asmitā, rāga, dveṣa, abhiniveśa, different types of vṛttis (pramāṇa, viparyaya, vikalpa, nidrā, smṛti), the process of nirodha of vṛttis; maitri, karuṇā, muditā, upekṣā; description of yama, niyama, āsana and praṇayāma; kriyāyoga– tapa, svādhyāya and īśvara-praṇidhāna; different steps of samādhi, different types of saṃyama, vivekakhyāti, prajñā. Vedanta Darshan Vedanta Darshan- Nature of Brahma and Prakriti, Methods of Upasana; adhyasaand sanskar; nature of Atma, description of existence, principle of karma-phala, description o pancha kosha, different nature of paramatma/brahma, Ishwar, Four qualifications (Sadhan chatushtay).	12

IV	Upaniṣad and Vedanta Darśana (Philosophy of God) Introduction to Upaniṣads and Vedanta Darśana; Īśopaniṣad – Idea of renouncement, Karma Yoga, balance of Vidyā-Avidyā and Prakṛti-Vikṛti; Tattirīyopaniṣad – Different names of the God and their meaning, parting message of Guru to the graduating student (Śikṣāvallī), Nature of Brahma and Prakṛti, Methods of Upāsanā; Nature of Ātmā, Description of existence, principle of karma-phala, description of paṃca kośa, nature of mukti , process and way to achieve it, antaḥkaraṇa-śuddhi, different characteristics of paramātmā/brahma, Īśvara, Four qualifications (Sādhana-catuṣṭaya)	08
V	Purpose and Program for a Human Being based on the Vedic Darśana The purpose and program of a human being living on the basis of the Vedic Darśana, clarity and practice of human values and human conduct, the natural outcome of such a program on society, nature and tradition. Vedic system of living in a society - the idea of vratas and varaṇa (freedom of choice with commitment), Varṇa System, Āśrama System, Paṃca Mahāyajṇa, 16 Saṃskāras, etc.	06

Reference Books:

1. Acharya Udayveer Shastri, Sankhya Darshanam (vidyodaya Bhashyam), Govindram Hasanand.
2. Acharya Rajveer Shastri, Patanjal Yog Darśana Bhashyam, Arsha Sahitya Prachar Trust.
3. Acharya Udayveer Shastri, Brahma Sutra (Vedanta Darshanam), Govindram Hasanand.
4. Krishna, I. (2010) The SāṃkhyaKarika, BharatiyaVidyaPrakashan, 4th edition 5. Madhavacharya, Sarva-DarshanaSamgrah Chaukhambha Vidyabhavan, Varanasi.
6. Muller, F.M. (1928) The Six Systems of Indian Philosophy, London: Longmans Green and Co. Publication.
7. Maharaj O. () PatanjalYogpradeep, Geeta press Gorakhpur
8. Vachaspati M. Sankhyatatvakaumudi, Motilal Banarasi Das Publication.
9. Shreemad Bhagwat geeta
10. Shankaracharya, VivekChoodamani
11. Rajyoga, Swami Shivananda
12. The Nyāya Sutras of Gotama, Sinha, N. (Ed.). Motilal Banarsidass Publ. (1990).
13. Pandit Madanmohan Vidyasagar. Sanskar Samuchaya, Vijaykumar Govindram Hasanand. 1998
14. Vedic Vision: Ancient Insights Into Modern Life, Satyavrata Siddhantalankar, Vijay Krishn Lakhanpal, 1999

15. Sanskar Chandrika (Hindi), Dayananda Saraswati, and Satyavrata Siddhantalankar. Vijay Krishn Lakhanpal, (1990).
16. THE TAITTIRIYA Upanishad, Achari, Sri Rama Ramanuja. (2013).
17. Vedic religion: The Taittiriya-Upanishad with the commentaries of Sankaracharya Suresvaracharya and Sayana (Vidyarana). Sastri, A. Mahadeva.(2016).
18. Taittiriyopanishad Sankara Bhashya With Hindi Translation Gita Press 1936.
19. Gautama's Nyāyasūtras: With Vātsyāyana-Bhāṣya. Jha, Ganganatha, ed. Oriental Book Agency, 1939.
20. NyayaDarshnam, Acharya Udayveer Shastri, Vijaykumar Govindram Hasanand (2018)
21. VaisheeshikaDarshanam, Acharya Udayveer Shastri, Vijaykumar Govindram Hasanand (2017)
22. Chattejee, S.G. and Datta, D.M. (1960) An Introduction to Indian Philosophy,Calcutta: University of Calcutta Press.
23. A Foundation Course in Human Values and Profession Ethics (Text Book and Teachers' Manual), R. R. Gaur, R. Asthana, G. P. Bagaria (2019 Second Revised Edition), Excel Books, New Delhi [ISBN 978-93-87034-47-1].
24. Class notes on "Human Values in Vedic Darśana" available on www.uhv.org.in
25. PPTs for "Human Values in Vedic Darśana" available on www.uhv.org.in

BOE102: BUILDING SERVICES INSTALLATION, SAFETY & PRACTICES

Course Objectives

- To expose students to real-site installation practices
- To understand coordination challenges between civil & services
- To introduce safety, compliance, and maintenance thinking
- To improve site readiness for construction & facility roles
- To align learning with industry, audits, and defect liability practices

Course Outcomes

CO	Course Outcome Statement
CO1	Explain scope and coordination role of building services
CO2	Describe plumbing and sanitary installation practices
CO3	Understand electrical, earthing, and lightning systems
CO4	Explain fire and life safety systems from execution perspective
CO5	Apply inspection, testing, and maintenance principles

Unit–I: Overview of Building Services & Coordination 08

Classification of building services (MEPF); Role of civil engineer in services coordination; Interface between structure, finishing & services; Understanding service drawings and layouts; Shafts, ducts, and service zones planning; Common site coordination failures and solutions; Introduction to BIM-based coordination awareness.

Unit–II: Plumbing & Sanitary Installation Practices 08

Water supply systems (UGT, OHT, pumps); Pipe materials: GI, CPVC, UPVC, HDPE; Installation sequence in residential & institutional buildings; Sanitary fixtures, traps, vent pipes; Internal drainage systems; Testing: leakage, pressure & flow; Common defects and rectification methods.

Unit–III: Electrical, Earthing & Lightning Protection 08

Electrical load concepts and safety norms; Wiring systems used on site; Distribution boards and protective devices; Earthing: purpose, types, installation practices; Lightning protection system components; Safety during construction and operation; Role of engineer in audits and compliance.

Unit–IV: Fire Safety & Life Safety Systems 08

Fire hazards in buildings; Active vs passive fire protection systems; Fire extinguishers - types & applications; Fire detection and alarm systems; Emergency exits, staircases, signage; Fire safety norms during construction; Introduction to NBC & local fire authority compliance.

Unit–V: Inspection, Testing, Maintenance & Post-Occupancy 08

Inspection checklists for services; Testing & commissioning overview; Coordination during finishing & handover; Basics of operation & maintenance (O&M); Common failures after occupancy; Defect liability period responsibilities; Sustainability, safety, and lifecycle thinking.

Suggested Textbooks and Reference Books

1. Punmia, B. C., Jain, A. K., & Jain, A. K. Water Supply and Sanitary Engineering.
2. Birdie, G. S., & Jayakumar, J. S. Water Supply and Sanitary Engineering.
3. Uppal, S. L., & Raja, S. P. Electrical Installation Work.
4. Gupta, S., & Bhatnagar, R. Electrical Installations: Design, Practice and Management.
5. Bharati, B. S., & Rana, N. C. Electrical Wiring, Estimating and Costing.
6. Sharma, S. K. Fire Protection and Fire Engineering in Buildings.
7. Mukherjee, P. N. Construction Safety Management.
8. Jain, R. K. Safety Management in Construction.
9. Rangwala, S. C. Building Services Engineering.
10. Chakraborti, M. Building Construction and Services.
11. Usha, M. S. Facility Management: An Indian Perspective.
12. National Building Code of India (NBC), Latest Edition, Bureau of Indian Standards (BIS).
13. IS 4770: Code of Practice for Rainwater Harvesting, BIS.
14. IS 16700: Criteria for Structural Safety and Serviceability of Buildings in Fire, BIS.
15. Relevant CPWD and BIS MEP Guidelines (Plumbing, Electrical, and Fire Services).