EVALUATION SCHEME & SYLLABUS

FOR

REVISED OPEN ELECTIVES I
(VII SEMESTER)

[Effective from the Session: 2020-21]
## B.TECH.
### VII SEMESTER 2020-21

### REVISED OPEN ELECTIVE-I

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROE070</td>
<td>HUMAN VALUES IN SANKHAY YOGA AND VEDANTA DARSAN</td>
</tr>
<tr>
<td>ROE071</td>
<td>MODELLING AND SIMULATION OF DYNAMIC SYSTEMS</td>
</tr>
<tr>
<td>ROE072</td>
<td>INTRODUCTION TO SMART GRID</td>
</tr>
<tr>
<td>ROE073</td>
<td>CLOUD COMPUTING</td>
</tr>
<tr>
<td>ROE074</td>
<td>UNDERSTANDING THE HUMAN BEING COMPREHENSIVELY - HUMAN ASPIRATIONS AND ITS FULFILLMENT</td>
</tr>
<tr>
<td>ROE075</td>
<td>AUTOMATION AND ROBOTICS</td>
</tr>
<tr>
<td>ROE076</td>
<td>COMPUTERIZED PROCESS CONTROL</td>
</tr>
<tr>
<td>ROE077</td>
<td>MODELING OF FIELD-EFFECT NANO DEVICES</td>
</tr>
<tr>
<td>ROE078</td>
<td>QUALITY MANAGEMENT</td>
</tr>
<tr>
<td>ROE079</td>
<td>GIS &amp; REMOTE SENSING</td>
</tr>
<tr>
<td>ROE080</td>
<td>HUMAN VALUES IN BUDDHA AND JAIN DARSHAN</td>
</tr>
<tr>
<td>ROE 070</td>
<td>Human Values in Sankhya, Yoga and Vedanta Darshan</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Version No.:</td>
<td>2.0 (updated as on June 12 '19)</td>
</tr>
<tr>
<td>Prerequisite:</td>
<td>KVE 301/401- Universal Human Values and Professional Ethics</td>
</tr>
</tbody>
</table>
| Objectives: | 1. To help students understand the basic principles of Sankhya, Yoga and Vedanta Darshan.  
2. To help students understand the existential realities including the human existence through Sankhya, Yoga and Vedanta Darshan.  
3. To help them to see the participation of human beings in the nature/existential realities (i.e. human values) and therefore the human conduct through each one of them.  
4. To help students apply this understanding to make their living better at different levels - individual, family, society and nature.  
5. To facilitate the students in applying this understanding in their profession and lead an ethical life. |
| Course Outcome: | On completion of this course, the students will be able to  
1. Understand the basic concepts of Sankhya, Yoga and Vedanta Darshan.  
2. Understand the human being, the needs and activities of human being through Sankhya, Yoga and Vedanta Darshan.  
3. Understand the whole existence.  
4. Understand the role of human being in the entire existence, thus getting clarity about values at all levels of living and human conduct.  
5. Understand the foundation of human society and human tradition. |
| Catalogue Description: | Sankhya, Yoga and Vedanta Darshan form a part of the philosophy of Indian tradition. This course outlines the basic concepts and principles of these three 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 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. |
| Module I: Introduction to Sankhya, Yoga and Vedanta Darshan and their Basics | Need to study Sankhya, Yoga and Vedanta Darshan; the origin of the three philosophies and their basic principles and scope for further reading. |
| Module II: Sankhya Darshan | Sankhya Darshan- the nature of Purush and Prakriti, 8 types of prakriti (pradhan mahattatva, ahankar and five tanmatras- sound, touch, form, taste and smell) and their 16 evolutes (vicar); pramana (pratyaksha, anumana and agama), bondage and salvation (liberation), the principle of satkaryavad, sense organs, work organs, trigunatmak prakriti |
### Module III: Yoga Darshan

Yoga Darshan- the steps of Ashtanga yoga (yama, niyama, aasana, pranayama, pratyahara, dharana, dhyan and samadhi) and the challenges in following them, afflictions (klesha)- avidya, asmita, raga, dvesha, abhinivesh, different types of vritti (pramana, viparyaya, vikalp, nidra, smriti), the process of nirodha of vritti; maitri, karuna, mudita, upaksha, description of yama, niyama, aasana and pranayama; kriyayoga –tapa, swadhyaya and ishwar-pranidhana, different steps of samadhi, different types of sanyama, vivekakhyati and pragya.

### Module IV : Vedanta Darshan

Vedanta Darshan- Nature of Brahma and Prakriti, Methods of Upasana; adhyasa and sanskar; nature of Atma, description of existence, principle of karma-phala, description of pancha kosha, different nature of paramatma/brhma, Ishwar, Four qualifications (Sadhan-chatushtay).

### Module V : Purpose and Program for a Human Being based on the Three Darshan

The purpose and program of a human being living on the basis of the three darshanas, 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.

### Text Books:


### References:


### Mode of Evaluation:

Assignment/ Seminar/Continuous Assessment Test/Semester End Exam
ROE-071 MODELLING AND SIMULATION OF DYNAMIC SYSTEMS

COURSE OBJECTIVE: Students undergoing this course are expected to-
1. Define, describe and apply basic concepts related to modeling and simulation.
2. Use conservation laws and constitutive relationships and other physical relations to model mechanical, electrical and flow systems, and combinations of these.

COURSE OUTCOME: After completion of the course student will be able to-
CO1: Define, describe and apply basic concepts related to modeling and simulation.
CO2: Construct bond graphs for the type of systems mentioned above, simplify and analyze the bond graph according to causality conflicts.
CO3: Use conservation laws and constitutive relationships and other physical relations to model mechanical, electrical and flow systems.
CO4: Find dynamic response and transfer function using various tools for system modeling.
CO5: Model and simulate mechanical and electrical systems using the computer tools Simulink.

ROE-071 MODELLING AND SIMULATION OF DYNAMIC SYSTEMS

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Introduction to modeling and simulation:</strong> 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.</td>
<td>8</td>
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<tr>
<td>2</td>
<td><strong>Bond graph modeling of dynamic system:</strong> Methods of drawing bond graph model- Mechanical systems &amp; Electrical systems, some basic system models- Mechanical systems, Thermal systems, hydraulic systems, pneumatic systems and electrical systems.</td>
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<tr>
<td>3</td>
<td><strong>System models of combined systems:</strong> Linearity and non linearity in systems combined rotary and translatory system, electro mechanical system, hydro-mechanical system.</td>
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<td>4</td>
<td><strong>Dynamic Response and System Transfer Function:</strong> Dynamic response of 1st order system and 2nd order system, performance measures for 2nd order system, system transfer function, transfer function of 1st and 2nd order system Block diagram algebra, signal flow diagram, state variable formulation, frequency response and bode plots.</td>
<td>8</td>
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<td>5</td>
<td><strong>Simulation and simulation applications:</strong> 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.</td>
<td>8</td>
</tr>
</tbody>
</table>

Text Books and References:
ROE-072 INTRODUCTION TO SMART GRID

COURSE OBJECTIVE: Students undergoing this course are expected to-
1. Present the fundamental concepts associated with Smart Grids.
2. Review renewable energy generation, grid integration energy storage technologies and future developments.
3. Introduce advanced management and control concepts of Smart Grids.

COURSE OUTCOME: After completion of the course student will be able to-

CO1: Identify the key elements of Smart Grids and visualize the roadmap towards next-Gen electricity networks.
CO2: Evaluate technology options pertaining to renewable energy generation, energy storage, data handling and communications for Smart Grids.
CO3: Justify technological and economical choices in the context of existing commercial Smart Grids projects.
CO4: Determine the relevance of Smart Grids projects, develop ways to evaluate their impacts and implications.
CO5: Analyse the new roles of utilities and consumers in Smart Grids.

<table>
<thead>
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</tr>
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<tr>
<td>1</td>
<td><strong>Introduction: Introduction to Smart Grid:</strong> Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities &amp; Barriers of Smart Grid, Difference between conventional &amp; smart grid, Concept of Resilient &amp; Self Healing Grid, Present development &amp; International policies in Smart Grid. Case study of Smart Grid. CDM opportunities in Smart Grid.</td>
<td>8</td>
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<tr>
<td>2</td>
<td><strong>Smart Grid Technologies:</strong> 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 &amp; Building Automation.</td>
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<td>3</td>
<td><strong>Smart Grid Technologies:</strong> Smart Substations, Substation Automation, Feeder Automation, Geographic Information System (GIS), Intelligent Electronic Devices (IED) &amp; their application for monitoring &amp; 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 &amp; control of power system.</td>
<td>8</td>
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<tr>
<td>4</td>
<td><strong>Microgrids and Distributed Energy Resources:</strong> Concept of microgrid, need &amp; application of microgrid, formation of microgrid, Issues of interconnection, protection &amp; control of microgrid, Plastic &amp; Organic solar cells, thin film solar cells, Variable speed wind generators, fuel cells, microturbines, Captive power plants, Integration of renewable energy sources.</td>
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<tr>
<td>5</td>
<td><strong>Power Quality Management in Smart Grid:</strong> Power Quality &amp; EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring.</td>
<td>8</td>
</tr>
</tbody>
</table>
Text Books:


Reference Books:

ROE-073  CLOUD COMPUTING

COURSE OBJECTIVE: Students undergoing this course are expected to-
1. Provide students with the fundamentals and essentials of Cloud Computing.
2. Provide students a sound foundation of the Cloud Computing so that they are able to
   start using and adopting Cloud Computing services and tools in their real life
   scenarios.

COURSE OUTCOME: After completion of the course student will be able to-
CO1: Articulate the main concepts, key technologies, strengths and limitations of
   cloud computing.
CO2: Learn the key and enabling technologies that help in the development of cloud.
CO3: Develop the ability to understand and use the architecture of compute and
   storage cloud, service and delivery models.
CO4: Explain the core issues of cloud computing such as resource management and
   security.
CO5: To appreciate the emergence of cloud as the next generation computing
   paradigm.

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Cloud Technologies And Advancements: Hadoop – Map Reduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine — Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.</td>
<td>8</td>
</tr>
</tbody>
</table>
Text and Reference Books:
COURSE OBJECTIVE: *Students undergoing this course are expected to-*

1. To help the students having the clarity about human aspirations, goal, activities and purpose of life.
2. To facilitate the competence to understand the harmony in nature/existence and participation of human being in the nature/existence.
3. To help the students to develop the understanding of human tradition and its various components.

COURSE METHODOLOGY:

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. It is free from any dogma or set of do’s and don’ts related to values.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated and encouraged to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
5. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

<table>
<thead>
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</tr>
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<tr>
<td>1</td>
<td><strong>Introduction:</strong> The basic human aspirations and their fulfillment through Right understanding and Resolution; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution.</td>
<td>8</td>
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<tr>
<td>2</td>
<td><strong>Understanding Human being and its expansion:</strong> The domain of right understanding starts from understanding the human being (the knower, the experiencer and the doer); and extends up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).</td>
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<td>3</td>
<td><strong>Activities of the Self:</strong> Understanding the human being comprehensively is the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Reasons for harmony/contradiction in the self.</td>
<td>8</td>
</tr>
</tbody>
</table>
4 **Understanding Co-existence with other orders:** The need and the process of inner evolution (through self-exploration, self-awareness and self-evaluation)- particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/order leading to comprehensive knowledge about the existence)

5 **Expansion of harmony from self to entire existence:** Understanding different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All-encompassing Resolution covering all four dimensions of human endeavour viz., realization, thought, behaviour and work (participation in the larger order) leading to harmony at all levels from self to Nature and entire Existence.

Reference Books:
2. Avartansheel Arthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India
3. Economy of Permanence – (a quest for social order based on non-violence), J.C.Kumarappa (2010), Sarva-Seva-Sangh-Prakashan, Varansi, India
5. IshandiiNauUpnishad, Shankaracharya, Geeta press, Gorakhpur,
6. Manav Vyavahar Darshan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
7. Manaviya Sanvidhan, A. Nagraj, Divya Path Sansthan, Amarkantak, India
14. Vyavaharvadi Samajshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India
15. Vyavahatmak Janvad, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
ROE-075 AUTOMATION AND ROBOTICS

COURSE OBJECTIVE: Students undergoing this course are expected to-
1. Acquire the knowledge on advanced algebraic tools for the description of motion.
2. Develop the ability to analyze and design the motion for articulated systems.
3. Develop an ability to use software tools for analysis and design of robotic systems

COURSE OUTCOME: After completion of the course student will be able to-
CO1: Use matrix algebra and Lie algebra for computing the kinematics of robot.
CO2: Calculate the forward kinematics and inverse kinematics of serial and parallel robots.
CO3: Calculate the Jacobian for serial and parallel robot.
CO4: Do the path planning for a robotic system.
CO5: Be proficient in the use of Maple or Matlab for the simulation of robots.

<table>
<thead>
<tr>
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<th>Topic</th>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>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.</td>
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<tr>
<td>2</td>
<td>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.</td>
<td>8</td>
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<tr>
<td>3</td>
<td>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.</td>
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<tr>
<td>Grippers. Mechanical, vacuum and magnetic grippers. Gripper force analysis and gripper design.</td>
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**Text Books and References:**

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.
ROE-076 COMPUTERIZED PROCESS CONTROL

COURSE OBJECTIVE: Students undergoing this course are expected to-
2. Analyse Industrial communication System.
4. Design Advanced Strategies For Computerised Process control.
5. Analyse Computerized Process Control.

COURSE OUTCOME: After completion of the course student will be able to-
CO1: Understand the Role of computers in process control, Elements of a computer aided Process control System, Classification of a Computer.
CO2: Design Phase Locked Local Loop, Mixers. Time Division Multiplexed System – TDM/PAM system.
CO4: Formulate of Cascade Control, Predictive control, Adaptive Control, Inferential control, Intelligent Control, Statistical control.
CO5: Design Electric Oven Temperature Control, Reheat Furnace Temperature control.

<table>
<thead>
<tr>
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<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>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</td>
<td>8</td>
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<tr>
<td>4</td>
<td>Advanced Strategies For Computerised Process control: Cascade Control, Predictive control, Adaptive Control, Inferential control, Intelligent Control, Statistical control.</td>
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</table>

Text Books:

Reference Books:
3. Krishan Kant, “Computer Based Industrial Control”
ROE-077 MODELING OF FIELD-EFFECT NANO DEVICES

COURSE OBJECTIVE: Students undergoing this course are expected to-
3. Introduce novel MOSFET devices and understand the advantages of multi-gate devices.
4. Introduce the concepts of nanoscale MOS transistor and their performance characteristics.
5. Study the various nano-scaled MOS transistor circuits.

COURSE OUTCOME: After completion of the course student will be able to-
CO1: Study the MOS devices used below 10nm and beyond with an eye on the future.
CO2: Understand and study the physics behind the operation of multi-gate systems.
CO3: Design circuits using nano-scaled MOS transistors with the physical insight of their functional characteristics.
CO4: Understand and study the physics behind the Radiation effects in SOI MOSFETs.
CO5: Understand the impact of device performance on digital circuits.

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Radiation effects in SOI MOSFETs, total ionizing dose effects – single-gate SOI – multi-gate devices, single event effect, scaling effects</td>
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**Text and Reference Books:**

## COURSE OBJECTIVE:
Students undergoing this course are expected to-
1. Introduce the importance of quality in improving competitiveness.
2. Understand the Implication of Quality on Business.
3. Implement Quality Implementation Programs.
4. Have exposure to challenges in Quality Improvement Programs.

## COURSE OUTCOME:
After completion of the course student will be able to-
CO1: Realize the importance of significance of quality.
CO2: Manage quality improvement teams.
CO3: Identify requirements of quality improvement programs.
CO4: Identify improvement areas based on cost of poor quality.
CO5: Organize for quality and development of quality culture through small group activities.

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<tr>
<td>1</td>
<td>Quality Concepts: Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of prototype. 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.</td>
<td>8</td>
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<tr>
<td>2</td>
<td>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.</td>
<td>8</td>
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<tr>
<td>3</td>
<td>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.</td>
<td>8</td>
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<tr>
<td>4</td>
<td>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.</td>
<td>8</td>
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<tr>
<td>5</td>
<td>ISO-9000 and its concept of Quality Management, ISO 9000 series, Taguchi method, JIT in some details.</td>
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### Text and Reference Books:
ROE-079 GIS & REMOTE SENSING

COURSE OBJECTIVE: Students undergoing this course are expected to-


COURSE OUTCOME: After completion of the course student will be able to-

CO1: Understand about the principles of Remote Sensing and its advantages and limitations.
CO2: Retrieve the information content of remotely sensed data.
CO3: Apply problem specific remote sensing data for engineering applications.
CO4: Analyze spatial and attribute data for solving spatial problems.
CO5: Create GIS and cartographic outputs for presentation

### ROE-079 GIS & REMOTE SENSING

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basic component of remote sensing (RS), advantages and limitations of RS, possible use of RS techniques in assessment and monitoring of land and water resources; electromagnetic spectrum, energy interactions in the atmosphere and with the Earth’s surface; major atmospheric windows; principal applications of different wavelength regions; typical spectral reflectance curve for vegetation, soil and water, spectral signatures.</td>
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<tr>
<td>2</td>
<td>Different types of sensors and platforms; contrast ratio and possible causes of low contrast; aerial photography; types of aerial photographs, scale of aerial photographs, planning aerial photography- end lap and side lap; stereoscopic vision, requirements of stereoscopic photographs; air-photo interpretation- interpretation elements;</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>photogrammetry- measurements on a single vertical aerial photograph, measurements on a stereo-pair- vertical measurements by the parallax method; ground control for aerial photography; satellite remote sensing, multispectral scanner- whiskbroom and push-broom scanner; different types of resolutions; analysis of digital data- image restoration; image enhancement; information extraction, image classification, unsupervised classification, supervised classification, important consideration in the identification of training areas, vegetation indices.</td>
<td>8</td>
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<tr>
<td>4</td>
<td>Microwave remote sensing. GI Sand basic components, different sources of spatial data, basic spatial entities, major components of spatial data, Basic classes of map projections and their properties.</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>Methods of data input into GIS, Data editing, spatial data models and structures, Attribute data management, integrating data (map overlay) in GIS, Application of remote sensing and GIS for the management of land and water resources.</td>
<td>8</td>
</tr>
</tbody>
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Text & Reference Books:

**ROE 080**

**Human Values in Bauddha and Jain Darshan**

<table>
<thead>
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<th>Version No.:</th>
<th>2.0 (updated as on June 12th 2019)</th>
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| Prerequisite: | RVE 301/401 - Universal Human Values and Professional Ethics  
Desirable- 10 Day Vipassana Meditation course by Shri S. N. Goenka |

**Objectives:**

1. To help students understand the basic principles of Bauddha and Jain Darshan.
2. To help students understand the existential realities including the human existence through Bauddha and Jain Darshan.
3. To help them to see the participation of human beings in the nature/existential realities (i.e. human values) and therefore the human conduct through each one of them.
4. To help students apply this understanding to make their living better at different levels - individual, family, society and nature.
5. To facilitate the students in applying this understanding in their profession and lead an ethical life.

**Course Outcome:** On completion of this course, the students will be able to

1. Understand the basic concepts of Bauddha and Jain Darshan.
2. Understand the human being, the needs and activities of human being through Bauddha and Jain Darshan.
3. Understand the whole existence.
4. Understand the role of human being in the entire existence, thus getting clarity about values at all levels of living and human conduct.
5. Understand the foundation of human society and human tradition.

**Catalogue Description:** 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 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.

**Module I: Introduction to Bauddha and Jain Darshan and their Basics**

Need to study Bauddha and Jain Darshan; the origin of these philosophies, their basic principles and scope for further reading.

**Module 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.
Module 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.
Program – 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.

Module 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.

Module 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

Text Books:

References:
7. https://www.youtube.com/watch?v=cz7QHNvNFFA&list=PLPJVlVRVmhc4Z01fD57jbyzcm9I6W054x (English)
8. https://www.youtube.com/watch?v=r5bud1ybBDc&list=PLY9hraHvoLQLCkl7Z2DWKMGRAWU77bKFy (Hindi)

Mode of Evaluation: Assignment/ Seminar/ Continuous Assessment Test/Semester End Exam
Open Electives II

For

VIII Semester

Bachelor of Technology
(Choice Based Credit System)

2020-21
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject Code</th>
<th>Name of Elective(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ROE081</td>
<td>Digital and Social Media Marketing</td>
</tr>
<tr>
<td>2</td>
<td>ROE082</td>
<td>Entrepreneurship Development</td>
</tr>
<tr>
<td>3</td>
<td>ROE083</td>
<td>Machine Learning</td>
</tr>
<tr>
<td>4</td>
<td>ROE084</td>
<td>Micro and Smart Systems</td>
</tr>
<tr>
<td>5</td>
<td>ROE085</td>
<td>Operations Research</td>
</tr>
<tr>
<td>6</td>
<td>ROE086</td>
<td>Renewable Energy Resources</td>
</tr>
<tr>
<td>7</td>
<td>ROE087</td>
<td>*Human Values in Madhyasth Darshan</td>
</tr>
<tr>
<td>8</td>
<td>ROE088</td>
<td>*Values, Relationship &amp; Ethical Human Conduct-For a Happy &amp; Harmonious Society</td>
</tr>
<tr>
<td>9</td>
<td>ROE089</td>
<td><strong>Industrial Optimization Techniques</strong></td>
</tr>
</tbody>
</table>

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 two subjects (ROE087 & ROE088) only trained Faculty (who had done the FDP for these courses) will teach the courses.
UNIT-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.

UNIT-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

UNIT-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).

UNIT-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

UNIT-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,

Text books:
1. Moutsy Maiti: Internet Marketing, Oxford University Press India
2. Vandana, Ahuja; Digital Marketing, Oxford University Press India (November, 2015).
5. Tracy L. Tuten & Michael R. Solomon: Social Media Marketing (Sage Publication)
UNIT-I
Entreprenuership- 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.

UNIT-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.

UNIT-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.

UNIT-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.

UNIT-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.

Text books:
UNIT-I

DECISION TREE LEARNING - Decision tree learning algorithm-Inductive bias- Issues in Decision tree learning; ARTIFICIAL NEURAL NETWORKS – Perceptrons, Gradient descent and the Delta rule, Adaline, Multilayer networks, Derivation of backpropagation rule Backpropagation Algorithm Convergence, Generalization;

UNIT-II

UNIT-III
Computational Learning Theory: Sample Complexity for Finite Hypothesis spaces, Sample Complexity for Infinite Hypothesis spaces, The Mistake Bound Model of Learning; INSTANCE-BASED LEARNING – k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning

UNIT-IV
Genetic Algorithms: an illustrative example, Hypothesis space search, Genetic Programming, Models of Evolution and Learning; Learning first order rules-sequential covering algorithms-General to specific beam search-FOIL; REINFORCEMENT LEARNING - The Learning Task, Q Learning.

Text books:

ROE084 MICRO AND SMART SYSTEMS  

UNIT-I

UNIT-II
Micro sensors, actuators, systems and smart materials: Silicon capacitive accelerometer, piezoresistive pressure sensor, conductometric gas sensor, an electrostatic combo-drive, a magnetic microrelay, portable blood analyzer, piezoelectric inkjet print head, micromirror array for video projection, smart materials and systems.

UNIT-III
Micromachining technologies: silicon as a material for micro machining, thin film deposition, lithography, etching, silicon micromachining, specialized materials for Microsystems, advanced processes for micro fabrication.

UNIT-IV

UNIT-V

Text books:
UNIT-I
Introduction: Definition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study. Linear Programming: Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.

UNIT-II
Transportation Problems: Types of transportation problems, mathematical models, transportation algorithms, Assignment: Allocation and assignment problems and models, processing of job through machines.

UNIT-III
Network Techniques: Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem. Project Management: Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV
Theory of Games: Rectangular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model. Quality Systems: Elements of Queuing model, generalized poisson queing model, single server models.

UNIT-V
Inventory Control: Models of inventory, operation of inventory system, quantity discount. Replacement: Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text books:
ROE086: RENEWABLE ENERGY RESOURCES

UNIT-I

UNIT-II

UNIT-III

UNIT-IV

UNIT-V
Text books:

1. Raja etal, “Introduction to Non-ConventionaI Energy Resources” Scitech Publications.
Objectives:
1. To help students understand the basic principles of Madhyasth Darshan
2. To help students understand the existential realities including the human existence through Madhyasth Darshan
3. To help them to see the participation of human beings in the nature/existential realities (i.e. human values) and therefore the human conduct through each one of them
4. To help students apply this understanding to make their living better at different levels—individual, family, society and nature
5. To facilitate the students in applying this understanding in their profession and lead an ethical life

Course Outcome: On completion of this course, the students will be able to
1. Understand the basic concepts of Madhyasth Darshan
2. Understand the human being, the needs and activities of human being through Madhyasth Darshan
3. Understand the whole existence
4. Understand the role of human being in the entire existence, thus getting clarity about values at all levels of living and human conduct
5. Understand the foundation of human society and human tradition.

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.

Module 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.

Module 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 self-organization of the four orders, General direction and process of evolution in the nature/existence.

Module 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.
**Module 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).

**Module 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:**

**References:**

**Mode of Evaluation:** Assignment/ Seminar/Continuous Assessment Test/Semester End Exam
Pre-requisites- for this subject only those faculty will teach these courses who had done the FDP for these courses.

Course Objectives:
1. To help the students to understand the importance and types of relationship with expressions.
2. To develop the competence to think about the conceptual framework of undivided society as well as universal human order.
3. To help the students to develop the exposure for transition from current state to the undivided society and universal human order.

Course Methodology:
1. The methodology of this course is exploration and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. It is free from any dogma or set of do’s and don’ts related to values.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated and encouraged to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
5. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

Introduction to the course: Basic aspiration of a Human Being and program for its fulfilment, Need for family and relationship for a Human Being, Human-human relationship and role of behavior in its fulfilment, Human-rest of Nature relationship and role of work in its fulfilment, Comprehensive Human Goal, Need for Undivided Society, Need for Universal Human Order, an appraisal of the Current State, Appraisal of Efforts in this Direction in Human History.

UNIT-I
Understanding Human-Human Relationship & its fulfilment: Recognition of Human-Human Relationship, Recognition of feelings in relationship, Established Values and Expressed Values in Relationship, interrelatedness of feelings and their fulfillment, Expression of feelings, Types of relationship and their purpose, mutual evaluation in relationship, Meaning of justice in relationship, Justice leading to culture, civilization and Human Conduct.

UNIT-II
Justice from family to world family order: Undivided Society as continuity and expanse of Justice in behaviour – family to world family order, continuity of culture and civilization, Universal Order on the basis of Undivided Society, Conceptual Framework for Universal human order, Universal Human Order as continuity and expanse of order in living: from family order to world family order, a conceptual framework for universal human order.
**Program for Ensuring Undivided Society and Universal Human Order:**

**UNIT-IV**

**UNIT-V**
Human Tradition: Scope and Steps of Universal Human Order, Human Tradition (Ex. Family order to world family order), Steps for transition from the current state, Possibilities of participation of students in this direction, Present efforts in this direction, Sum up.

Text books:

2. Avartansheel Arthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
4. Economy of Permanence – (a quest for social order based on non-violence), J. C. Kumarappa (2010), Sarva-Seva-Sangh-Prakashan, Varansi, India.
11. Manav Vyavahar Darshan, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
12. Manaviya Sanvidhan, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
15. Slow is Beautiful, Cecile Andrews (http://www.newsociety.com/Books/S/Slow-is-Beautiful)
21. The Communist Manifesto, Karl Marx, 1848.

Reference Videos.

1. Kin school (30 minutes)
2. Technology (Solar City etc.).
3. Natural Farming.
4. Economics of Happiness (1h 8m).
ROE-089 Industrial Optimization Techniques

### Course Objectives:

The objective of this course is to familiarize the graduate engineers with techniques in linear programming, sequencing and network analysis, theory of games and Queuing models, Dynamic Programming and Simulation and Inventory control and Replacement Models. It aims to equip the students with standard concepts and tools from previously gained knowledge to an advanced level that will enable them to tackle more advanced level of Optimization techniques and applications that they would find useful in their disciplines.

The students will learn:

- To apply the knowledge of linear programming and application in the field of engineering.
- To deal with sequencing and network analysis for optimizing the results of real life problems and Engineers.
- To deals with Theory of Games and Queueing Models to solve engineering problems involving real life situations etc.
- To deal with dynamic programming and simulation that is required in different branches of Engineering to graduate engineers for applying real pictures in case of complicated systems.
- To deals with inventory control and replacement Models to solve engineering problems involving real market and real life situations etc.

### Unit-wise Details:

<table>
<thead>
<tr>
<th>Unit</th>
<th>Topic</th>
<th>Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Linear Programming: Historical development of optimization, engineering application of optimization, formulation of design problems as a mathematical programming problem. Graphical method of solution, Simplex method, Dual Simplex method and its application in engineering.</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>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.</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>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 $2 \times n$ or $m \times 2$ games. Queuing model: Introduction, Application of Queuing model, generalized Poisson queuing model, single server models and multiple channel Queuing model and their applications in Engineering.</td>
<td>8</td>
</tr>
</tbody>
</table>
**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.

**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.

**Text Books:**

**Reference Books:**

**COURSE OUTCOMES:**

<table>
<thead>
<tr>
<th>Course Outcome (CO)</th>
<th>Bloom’s Knowledge Level (KL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO 1</td>
<td>Remember the concept of simultaneous equations, apply for evaluating mathematical programming problems to evaluate optimal solution</td>
</tr>
<tr>
<td>CO 2</td>
<td>Understand the concept of extrema to create, critical path and analyzing for application in Engineering.</td>
</tr>
<tr>
<td>CO 3</td>
<td>Remember the concept of matrices, maxima and minimize to evaluate the value of the game and create the model</td>
</tr>
<tr>
<td>CO 4</td>
<td>Analyze the concept of simulation in different ways by simulation techniques methods.</td>
</tr>
<tr>
<td>CO 5</td>
<td>Applying the concept of extrema to evaluate inventory and replenishment problems</td>
</tr>
</tbody>
</table>

K₁ – Remember, K₂ – Understand, K₃ – Apply, K₄ – Analyze, K₅ – Evaluate, K₆ – Create