



**Bharatiya Vidya Bhavan's**

**SARDAR PATEL COLLEGE OF ENGINEERING**



(Government Aided Autonomous Institute under Mumbai University) Andheri  
(W), Mumbai – 400058

# **COURSE CONTENTS**

**Sem. III**

**S. Y. B.Tech. (ELECTRICAL) ENGINEERING**

**Academic Year: 2019-2020**

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**Course Objectives:**

1. To learn Laplace & Inverse Laplace transforms and its application to solve differential equations.
2. To understand concept of Fourier series, its complex form and enhance problem solving skills.
3. To understand concept of complex variables and conformal mapping.
4. To learn various matrices, operations and important theorems.

**Course Outcomes:**

At the end of the course the students shall be able to

1. Solve problems based on Laplace and inverse Laplace transform. Apply theory of Laplace transforms to evaluate real integrals and solve initial & boundary value problems.
2. Solve problem based on Fourier series expansion.
3. Solve complex variable problems.
4. Find rank of matrices, Eigen values and Eigen vectors of matrices

**Course Content**

Module	Details	Hrs
1	<p><b>Laplace Transforms</b></p> <p>Function of bounded variation (Statement only) Laplace Transforms of <math>1, e^{at}, \sin at, \cos at, \sinh at, \cosh at, t^n, \operatorname{erf} \left( t \right), J_0(t)</math>, Shifting theorems, change of scale, <math>L\{t^n f(t)\}, L\left\{\frac{f(t)}{t}\right\}, L\left\{\frac{d^n f(t)}{dt^n}\right\}, L\left\{\int_0^t f(u)du\right\}</math></p> <p>Convolution theorem, Evaluation of real integrals using Laplace transforms.</p>	07
2	<p><b>Inverse Laplace Transforms</b></p> <p>Evaluation of Inverse Laplace Transforms using partial fractions, convolution theorem, shifting theorems and other properties.</p> <p>Application of Laplace Transform to solve initial &amp; boundary value problems involving ordinary differential equation with one dependent variables</p>	06
3	<p><b>Fourier Series &amp; Integrals</b></p> <p>Orthogonal &amp; Orthonormal set of functions. Fourier series, Determination of</p>	05

	<p>Fourier constants, Dirichlet's conditions</p> <p><b>Fourier series for</b></p> $f(x), x \in [c, c + 2\pi] \text{ and } x \in [c, c + 2L]$	
4	<p><b>Fourier Series half range &amp; complex form</b></p> <p>Fourier series of Odd and Even functions</p> <p>Half range Fourier Sine &amp; Cosine series, Parseval's Identity</p> <p>Complex form of Fourier series.</p>	05
5	<p><b>Complex Variables &amp; Mapping</b></p> <p>Functions of complex variable, Analytic functions, Cauchy-Riemann equations in Cartesian and polar coordinates.</p> <p>Harmonic functions, Analytic method and Milne Thomson methods to find <math>f(z)</math>, orthogonal trajectories.</p> <p>Conformal mapping, Bilinear transformation, cross ratio, fixed points.</p>	07
6	<p><b>Matrices</b></p> <p>Orthogonal, Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian &amp; Unitary matrices and their elementary properties.</p> <p>Elementary operations and their use in getting the Rank, Normal form of a matrix, PAQ form, Consistency of system of linear homogeneous and non-homogeneous equations.</p>	06
7	<p><b>Eigen values &amp; Cayley Hamilton</b></p> <p>Eigen-values and Eigenvectors of a matrix, Cayley- Hamilton theorem, Function of a matrix, Diagonalization of a matrix</p>	06

\*A total of 10 tutorials to be taken batch wise covering the entire syllabus.

**]Text Books:-**

1. B S Grewal (2014), “Higher Engineering Mathematics”, Khanna Publications, 43<sup>rd</sup> Edition, ISBN 8174091955, 1315 Pages

**Reference Books:-**

1. Erwin Kreyszig (2010), “Advanced Engineering Mathematics” Wiley Eastern Limited, Singapore 10<sup>th</sup> edition, ISBN 8126554231, 1148 Pages.
2. Text book of Engineering Mathematics , N.P.Bali , Laxmi Publications, 9<sup>th</sup> edition,ISBN:978-81-318-0832-0

<b>Sr No</b>	<b>Examination</b>	<b>Module</b>
1	T – I	1 , 2 and part of 3
2	T – II	Remaining part of 3, 4 and part of module 5
3	Final exam	1 to 7

**Prerequisite:** P-N junction diode, BJT, FET characteristics (Course Basic Electricity and Electronics)

**Course Objectives:**

1. Introduce Clipping and Clamping Circuits.
2. Discuss various transistors and its biasing techniques.
3. Introduce configurations and applications of Differential amplifier.
4. Discuss Op-amp and its practical applications and basics of analog and digital converter circuits.

**Course Outcomes:** Students will demonstrate the ability to

1. Select appropriate electronic devices to design clippers and clampers.
2. Understand various biasing techniques for BJT and FET.
3. Understand differential amplifier, ADCs and DACs.
4. Select appropriate electronic components to design various op-amp circuits depending on application required.

**Course Contents:**

Module	Details	Hours
1	Application of diodes: Clippers, Clampers	04
2	Bipolar Junction Transistor: Different biasing techniques, Introduction to h-parameter equivalent circuit, Introduction to Stability Factors.	08
3	Field Effect Transistor: Different biasing techniques, Introduction to ac equivalent circuit. Introduction to MOSFET	05
4	Differential Amplifier Circuit Configuration: Introduction to DIBO, DISO, SIBO, SISO. Differential amplifier with swamping resistors, constant current bias and current mirror.	07
5	Operational amplifier(Op-amp):Block diagram representation of typical opamp, equivalent circuit	04
6	Op-amp applications: (i) Summing, scaling and averaging amplifiers, instrumentation amplifier, V to I converter(with floating load and grounded load) (ii) I to V converter, differentiator, integrator, Precision rectifier - half wave and full wave, comparator, zero crossing detector, Schmitt trigger, clipper, clamper, Peak Detector.	09
7	A/D and D/A converters Introduction, Basic A to D conversion techniques, Basic D to A conversion Techniques	05

**Text/ Reference Books:**

1. Robert Boylestad and Louis Nashelsky, „Electronic devices and circuits“, Prentice Hall of India, London

2. Donald A. Neamen, "Electronic Circuit Analysis and Design", Tata McGraw-Hill publishing Company Limited.
3. D. Roy Choudhari and Shail B. Jain, "Linear Integrated Circuits", New age International Publishers.
4. Gayakwad Ramakant, "Op-Amps and Linear Integrated Circuits", PHI publication
5. Bhargava, Kulshreshtha, Gupta., "Basic Electronics and Linear Circuits" TTTI Chandigarh, Tata McGraw Hill, New Delhi.
6. K.R. Botkar, "Integrated Circuits", Khanna Publication.
7. David Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press
8. Allen Mottershead, "Electronic Devices and Circuits an introduction", Prentice Hall of India.

<b>Sr. No.</b>	<b>Examination</b>	<b>Modules</b>
<b>1</b>	<b>Test 1</b>	<b>1,2,3</b>
<b>2</b>	<b>Test 2</b>	<b>4,5</b>
<b>3</b>	<b>End Semester</b>	<b>01-07</b>

**Course Objectives:**

1. Analysis of basic electrical circuits using various network theorems.
2. Introduction to the concept of graph theory and network topology.
3. Detailed study of RL, RC and RLC circuits and network analysis using Laplace transform.
4. Overview of network functions and two port network

**Course Outcomes:** Students will demonstrate the ability to

1. Apply network theorems for the analysis of electrical circuits.
2. Obtain the transient and steady-state response of electrical circuits.
3. Understand frequency domain analysis of Electrical network.
4. Analyze two port circuit behavior and determine network function of a given electrical network and construct an electrical network for a given driving point network function.

**Course Contents:**

<b>Module</b>	<b>Details</b>	<b>Hours</b>
<b>1</b>	Network Theorems for electrical networks excited by DC / AC sources: Networks with Dependent Sources, Mesh and Super-mesh analysis, Nodal and Super node analysis, Superposition theorem, Source transformation, Thevenin's theorem , Norton's theorem, Maximum Power transfer theorem, reciprocity theorem.	<b>08</b>
<b>2</b>	Graph Theory and Network Topology: Concept of Graph of a Network, Tree, co-tree, Incidence, cutset and tie-set matrices, their relation to the Kirchoff's Laws and concept of Duality.	<b>04</b>
<b>3</b>	RL, RC Circuit Analysis – General and Particular solutions of first order differential equations, Properties of exponential response, Geometrical interpretation of derivatives, Time constant, integrating factor, Initial Conditions in Network elements. Series and parallel RLC Circuit Analysis– Solution of Second order differential equations, Over-damped, critically damped and under-damped RLC circuit, Lossless LC circuits. RL, RC and RLC Networks excited by external Energy Sources like step, ramp, impulse and sinusoidal source. Series Resonance, Parallel Resonance	<b>10</b>
<b>4</b>	Electrical Circuit Analysis Using Laplace Transform Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances	<b>06</b>
<b>5</b>	Network Functions: Terminal pairs or ports, network functions for one port and two port networks, calculation of network functions for general networks. Concept of poles & zeros, Restrictions on poles & zeros for	<b>06</b>

	driving point function and transfer function, Time domain behavior from pole-zero plots, Stability of active network, Routh – Hurwitz criterion.	
<b>6</b>	Two Port Network: Z and Y parameters, input and output impedance in terms of two port parameters, Relation between Z and Y parameters.	<b>04</b>
<b>7</b>	Network synthesis: Properties of positive real function, Driving point synthesis of LC, RC and RL networks, Foster and Cauer forms.	<b>04</b>

**Text/ Reference Books:**

1. M.E. Van Valkenburg: Network Analysis. Prentice-Hall of India Pvt. Limited, Eastern Economy Edition.
2. W. H. Hayt, and J. E. Kemmerly: Engineering Circuits Analysis, Tata-McGraw HILL Publicatio.
3. Chakrabarti A.: Circuit Theory (Analysis & Synthesis), Dhanpat Rai & Co.
4. Roy Chaudhary D.: Networks & Systems, New Age International Publisher.
5. Schaum's Outline Series: Electrical network.
6. M.E. Van Valkenburg: Introduction to Modern Network Synthesis, Wiley Eastern Limited.

<b>Sr. No.</b>	<b>Examination</b>	<b>Modules</b>
<b>1</b>	<b>Test 1</b>	<b>1,2</b>
<b>2</b>	<b>Test 2</b>	<b>3, 4</b>
<b>3</b>	<b>End Semester</b>	<b>1-7</b>

**Course Objectives:**

1. Understand the number systems and coding.
2. Discuss the features of combinational circuits.
3. Understand flip flops and their applications.
4. Remember different logic families, their interfacing and memories

**Course Outcomes:** Students will demonstrate the ability to

1. Differentiate between number systems and classify different binary codes.
2. Analyze and design combinational circuits.
3. Design of sequential circuits and registers using Flip Flops.
4. Classify different logic families and memories.

**Course Contents:**

<b>Module</b>	<b>Details</b>	<b>Hours</b>
<b>1</b>	Number System and Codes: Binary, Octal, Hexadecimal number systems, Conversion from one system to another, Binary Arithmetic, BCD, GRAY, Alphanumeric codes, Error detecting codes-odd and even parity, error detecting and correcting codes-Hamming codes	<b>06</b>
<b>2</b>	Combinational circuits: Derive Gates, Max terms, Min terms, SOP and POS implementation, K-Maps and their use in simplifying Boolean expressions, Implementing a logic function using universal	<b>06</b>
<b>3</b>	Combination Logic Circuit Design: (i) Adders, Subtractors (Half and Full), carry look ahead adder, serial adder, magnitude comparators (ii) Arithmetic logic units, multiplexers, demultiplexers parity encoder, code converter, Hazards in Combinational circuits.	<b>07</b>
<b>4</b>	Sequential Logic Circuits: Comparison of combinational and sequential circuits, Flip-flops: SR, T, D, JK, Master-slave JK, converting one flip flop to another, de-bounce switch, Counter: Ripple counter, up-down counter, Synchronous counter ,designing of counters, state transition diagram, ring counter, twisted ring counter, Un used states and locked conditions.	<b>08</b>
<b>5</b>	Registers: SISO, SIPO, PISO, PIPO registers, pseudorandom sequence generator.	<b>05</b>
<b>6</b>	Logic Families: Characteristics of digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic	<b>05</b>
<b>7</b>	Semiconductor memories : Memory organization and operation, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory(RAM), content addressable memory (CAM), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex	<b>05</b>

	Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).	
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**Text/ Reference Books:**

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

<b>Sr. No.</b>	<b>Examination</b>	<b>Modules</b>
<b>1</b>	<b>Test 1</b>	<b>1,2,3(i)</b>
<b>2</b>	<b>Test 2</b>	<b>3(i),4</b>
<b>3</b>	<b>End Semester</b>	<b>01-07</b>

**Course Code: PC-BTE304    Course:-Electrical Network Laboratory    (AY 2019-20)**

**Course Objectives:**

1. To simulate various electric circuits using Pspice/ MATLAB/e-Sim / Scilab
2. gain practical experience on simulation of electric circuits and verification of theorems.

**Course Outcomes:** Students will demonstrate the ability to

1. Evaluate response in a given network by using theorems.
2. Analyze complex DC and AC networks.
3. Analyze transient and steady state circuit responses.

**Course Contents:**

<b>Sr No.</b>	<b>List of Experiments</b>	<b>Hours</b>
1.	Mesh and nodal analysis of electric circuits.	<b>02</b>
2	Verification of network theorems in dc circuit.	<b>02</b>
3	Verification of network theorems in ac circuits.	<b>02</b>
4	Transient response of R-L and R-C networks	<b>02</b>
5	Transient response of R-L-C series and parallel electric circuit.	<b>02</b>
6	Frequency response(magnitude and phase plots)	<b>02</b>
7	Design and Simulation of series resonance circuit.	<b>02</b>
8	Design and Simulation of parallel resonant circuits.	<b>02</b>
9	Network functions of two port network.	<b>02</b>
10	Two port network parameters-Z and Y parameters simulation .	<b>02</b>

**Course Code: PC-BTE305      Course:-Electronic Circuit Laboratory      (AY 2019-20)**

**Course Objectives:**

1. Understand diode as a Clipper and Clamper.
2. Analysis of transistors, practical applications of Op-amp.
3. Understand working of Differential amplifier, instrumentation amplifier
4. Learn to develop application based on electronics circuits

**Course Outcomes:** Students will demonstrate the ability to

1. Design clippers and clampers, Calculate parameters of transistors from characteristics.
2. Calculate CMRR of differential amplifier, Understand and use instrumentation amplifier
3. Select appropriate electronic components to design various op-amp circuits depending on application required.
4. Develop managerial skills

**Course Contents:**

<b>Expt No</b>	<b>Title</b>	<b>Hours</b>
<b>1</b>	Diode as clipper	<b>02</b>
<b>2</b>	Diode as clamper	<b>02</b>
<b>3</b>	Differential Amplifier	<b>02</b>
<b>4</b>	Transfer Characteristics of op-amo	<b>02</b>
<b>5</b>	V to I converter	<b>02</b>
<b>6</b>	Integrator	<b>02</b>
<b>7</b>	Differentiator	<b>02</b>
<b>8</b>	Schmitt Trigger	<b>02</b>
<b>9</b>	Instrumentation Amplifier	<b>02</b>

Student should complete mini project in a group of 4-5 students. The group has to present the project and submit the project report

**Course Code: PC-BTE306 Course:-Digital Electronics Laboratory (AY 2019-20)**

**Course Objectives:**

1. Understand the basics of circuit making on bread board
2. Test the working of the circuit
3. Introduce simulation using software
4. Learn to develop application based on digital electronics circuits

**Course Outcomes:** Students will demonstrate the ability to

1. Design given circuits using discrete components
2. Understand the basics of simulation.
3. Test the designed circuit to get required output.
4. Develop managerial skills

**Course Contents:**

<b>Expt No</b>	<b>Title</b>	<b>Hours</b>
<b>1</b>	Logic Expressions simplification and implementation.	<b>02</b>
<b>2</b>	Half Adder and Half subtractor using gate IC"s	<b>02</b>
<b>3</b>	Code Converter: Binary to Gray, BCD to XS-3.	<b>02</b>
<b>4</b>	IC7483 as 4bit adder and subtractor	<b>02</b>
<b>5</b>	Multiplexer 4:1 using gates.	<b>02</b>
<b>6</b>	De-multiplexer 1:16 using TINAs software.	<b>02</b>
<b>7</b>	Flip-Flops: S-R,J-K,D, T using only NAND gates.	<b>02</b>
<b>8</b>	BCD Counter	<b>02</b>
<b>9</b>	Ring Counter, Twisted Ring Counter.	<b>02</b>
<b>10</b>	PLD Simulation	<b>02</b>

Student should complete mini project in a group of 4-5 students. The group has to present the project and submit the project report

**Course Code: HSM-BTE301**

**Course:- Organizational Communication and Interpersonal Skills**

**(AY 2019-20)**

**Course Objective:**

1. To enhance effective corporate communication through professional writing
2. To prepare students for successful career that meets the corporate, industrial and global requirement. To prepare students for successful career that meets the corporate, industrial and global requirement
3. To enable students to communicate in professional environment and social context with knowledge of professional etiquette, and understand social responsibilities with multi- disciplinary approach, in all tasks of life.
4. To discern and develop effective organizational writing.
5. To inculcate in students professional and ethical attitude at the workplace and develop an ability to imbibe effective interpersonal skills.

**Course Outcome:**

Upon successful completion of this Course learners will be able to

1. Develop professional communication using precise language and
2. Apply the traits of a suitable candidate for a job/ higher education, through training and participation in group discussions, facing interviews and writing resume/ SOP
3. Demonstrate awareness of corporate etiquette and knowledge of professional responsibilities
4. Design technical documents using precise and objective language, apt for organizational communication
5. Deliver formal presentations effectively and develop life skills/ interpersonal skills to progress professionally by building stronger relationships in the society

**Course Content:**

<b>Module</b>	<b>Details</b>	<b>Hrs.</b>
01	<b>Business writing:</b> <ul style="list-style-type: none"><li>• Types of meetings, Notice, Agenda, Minutes of the meetings, Strategies for conducting effective meetings.</li><li>• Email writing: ( Netiquette).</li></ul>	04
02	<b>Employment Skills:</b> <ul style="list-style-type: none"><li>• Group Discussion</li><li>• SWOT Analysis</li><li>• Resume Writing / Curriculum Vitae</li><li>• Interview Skills</li><li>• Statement of Purpose</li></ul>	09

03	<b>Introduction to Corporate Etiquette and Core Values:</b> <ul style="list-style-type: none"> <li>• Etiquettes and rules of behavior</li> <li>• Professional Conduct,</li> <li>• Etiquette in Meetings</li> <li>• Dining Etiquettes.</li> <li>• Core Values of an organization</li> </ul>	03
04	<b>Report writing:</b> <ul style="list-style-type: none"> <li>• Objectives of report writing,</li> <li>• Language and style in a report,</li> <li>• Types of reports.</li> <li>• <b>Formats of reports:</b> Memo, Letter, and Project report Survey based. (<i>A Computer- aided presentation of the Project report</i>)</li> </ul> <b>Proposal Writing:</b> <ul style="list-style-type: none"> <li>• Format and style. Technical Proposals:</li> <li>• Objectives of technical proposals,</li> <li>• Parts of proposals.</li> </ul>	06
05	<b>Personal Communication and Soft Skills:</b> <ul style="list-style-type: none"> <li>• Creating and delivering effective presentations</li> <li>• Working and communication in teams</li> <li>• Leadership skills</li> <li>• Time management</li> <li>• Conflict resolution and negotiation skills.</li> </ul>	06

### List of Assignments:

1. Meeting documentation: Role play and written assignment
2. Practical sessions on Group Discussion topics
3. Mock Interviews, Job application and resume writing.
4. Etiquettes case study and role play. MCQ's
5. Three assignments on report-writing (A Bound report to be submitted on topic given in partial fulfillment of the syllabus report writing, Report content will be graded and counted during presentation, a printed copy of the presentation and a soft copy in the form of CD to be attached with the report).
6. Technical Proposal (Group activity, document of the proposals)
7. Interpersonal Skills: Case Studies, Group Activity and assignments
8. Presentations and seminar on module no. 4, 5 with Power point
9. Role play and videos taken by students.

### Distribution of Term Work/ Practical marks shall be as follows: (total 25 marks).

1. Project report presentation : **10 marks**
2. Presentations on Interpersonal topics: **05 marks**
3. Group Discussion : **05 marks**
4. **Mock Interviews: 05 marks**

**List of Text Books (T – Symbol for Text Books) to be Referred by Students**

Sr. No	Text Book Titles	Author/s	Publisher	Edition	Module Nos.
1	Report Writing for Business	Lesiker and Petit	Mc Graw Hill	10	1
2	Technical Writing for Professional Communication	Huckin and Olsen	Mc Graw Hill	2	1, 2
3	Personal development for Life and Work	Wallace and Masters	Thomson Learning	12	3,4,5,6
4	Effective Business Communication	Herta Murphy	Mc Graw Hill	7	1,2,3, 4,6
5	Organizational Behaviour	Fred Luthans	Mc Graw Hill	12	3,5
6					
7	Business Correspondence and Report Writing	R.C. Sharma and Krishna Mohan	Tata McGraw Hill	2	1,2,4,6
8	Soft skills	Dr. K.Alex	S. Chand and company	3	3,5,6
9	Professional Ethics	R.Subramaniam	OUP		5
10	Organizational Behaviour	Robbins Stephens	Pearson Education	12	3

**List of Reference Books (R – Symbol for Reference Books) to be Referred by Students**

Sr. No	Reference Book Titles	Author/s	Publisher	Edition	Module Nos.
1	How to Speak Fluently	Jones	Indian Publishing House	1st	6
2	Speaking English Effectively	Krishna Mohan N.P. Singh	Macmillan	2nd	6
3	“Business Communication - Concepts Cases and Applications”	Chaturvedi and Chaturdevi	Pearson	2nd	5
4	“Communication Skills for Engineers”	Sunita Mishra and C. Murlikrishna	Pearson	1st	6
5	Business Communication- “Building Critical Skills”	Kitty O Locker	McGraw Hill	3rd	3, 4
6	“Body Language”,	Alan Pease	Manjul Publications	18th	3, 4,6
7	“The Craft of Business Letter Writing”	Monipally	Tata McGraw Hill	1st	6
8	Soft Skills and Professional Communication	Francis Peter	Tata McGraw Hill	1st	3, 6
9	50 ways to improve your Business English	Ken Taylor	Summertown Publishing	1st	1, 5
10	50 ways to improve your Presentation Skills in English	Bob Digen	Summertown Publishing	1st	6

**List of E - Books (E – Symbol for E-Books) to be Referred by Students**

Sr. No	E- Book Titles	Author/s	Publisher	Edition	Module Nos.
1	Business Communication Today	Courtland L Bovee	Pretince Hall	--	3, 5, 6
2	Excellence in Business Communication	John Thill	Pretince Hall	6	4,
3	Business Communication: Building Critical Skills	Kitty O Locker	Mc Graw Hill	--	3
4					

**Examinations:**

Sr. No.	Examination	Module
1	T – I	01, 2
2	T – II	3, 5
3	Final Examination	1, 2, 3, 4, 5

## Value Added Courses

### 1. Soft Computing I (VA-BTE01)

**Course Objective:** Provide knowledge of MATLAB/ SCILAB.

**Course Outcome:** Students will be able to develop good applications using MATLAB/ SCILAB

**Course content:** 1. Basic Introduction and Overview, 2. Variables and Data types, 3. Operation, Control Structure, 4. Function, Introduction to different tool boxes available, 5. introduction to MATLAB simulink

### 2. Introduction to Python (VA-BTE02)

**Course Objective:** Provide knowledge of Python

**Course Outcome:** Students will be able to develop good applications using Python

**Course content:** 1. Basic Introduction and Overview, 2. Variables and Data types., 3. Operations in Python, Control Structure, List, Tuples and Dictionary, 4. Function, Introduction to turtle and some introduction to modules, Exception handling, 5.Object oriented in python, Numpy, Matplotlib.

## Value Added Courses by Industry

### Course code: VA- BTI01 Course: Basic Automation – 1 (PLC and HMI) (AY2019-20)

Course Duration: 40 hours

Prerequisite: Basic Knowledge of Automation technology, relay logic essential but not mandatory

Course Objectives : The participants will

1. understand working of PLC
2. understand basic concepts of HMI

Course Outcomes: The participants will be able to

1. use Siemens PLC by understanding installation and by applying the knowledge of programming

Course Contents:

Module	Details
1	<b>Basic constituents of PLC:</b> Signal modules, CPU, Power Supply, mounting rail and MMC
2	<b>Working</b> of PLC, Installation guidelines, powering and wiring of modules with information on addressing.
3	<b>Programming:</b> Programming language and representation in STL,FBD and LAD, Hardware Configuration and setting object Properties of Modules in STEP, Programming instruction: AND, OR, AND-before-OR, OR-before-AND, NO / NC contacts, Edge detection instructions, Set/ Reset, Elementary data type.
4	<b>Overview of SIMATIC S7 – PLC:</b> Programming Units and using PC as Programming Unit, Hardware Configuration and setting object Properties of Modules in STEP, Step 7 Instructions and programming: Set/ Reset, Elementary data type, Load/Transfer, comparison, basic math instructions, Timers/ Counters List etc
5	<b>Using Symbol Table and VAT.</b>



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# **COURSE CONTENTS**

**Sem. IV**

**S. Y. B.Tech. (ELECTRICAL) ENGINEERING**

**Academic Year: 2019-2020**

## List of Courses

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**Course Objectives:**

The main objectives of the course are

1. To provide an overview of probability and statistics to engineers.
2. Introduce Statistical methods, probability distribution and testing of hypothesis.
3. Introduce Complex Integrals.

**Course Outcomes:**

At the end of the course the students shall be able to

1. Solve problems in basic statistics, probability distribution and testing of hypothesis.
2. Apply statistical methods for analysing experimental data.
3. Solve the problems based on complex Integrals.

**Course Contents:**

<b>Module</b>	<b>Details</b>	<b>Hours</b>
<b>1</b>	<b>Statistics:</b> Correlation, Karl Pearson coefficient & Spearman's rank Correlation coefficient, linear regression, lines of regression. Curve fitting by the method of least squares.	<b>8</b>
<b>2</b>	<b>Discrete Random Variables:</b> Random variables, Probability distribution for discrete random variables, Expected value and Variance, Binomial Distribution and Poisson Distribution.	<b>6</b>
<b>3</b>	<b>Continuous Random Variables:</b> Probability Density Function for continuous random variable, Normal Distribution.	<b>4</b>
<b>4</b>	<b>Sampling Theory:</b> Sampling distribution. Test of Hypothesis. Level of significance, critical region. Large and small samples. Test of significance for Large samples: Test for significance of the difference between sample mean and population means, Test for significance of the difference between the means of two samples. Test for significance of the difference between sample S.D and population S.D, Test for significance of the difference between the S.D of two samples.	<b>6</b>
<b>5</b>	<b>T-Test:</b> Student's t-distribution and its properties. Test of significance of small samples. Test for significance of the difference between sample mean and population means, Test for significance of the difference between the means of two samples, Chi-square distribution and its properties.	<b>6</b>
<b>6</b>	<b>Numerical Methods 1:</b> Line Solution of polynomial and transcendental	<b>6</b>

	equations using Newton Raphson method. Solution of system of linear algebraic equations , by Gauss Elimination Method, Gauss Jacobi Iteration Method and Gauss Seidel Iteration Method	
<b>7</b>	<b>Numerical Methods II:</b> Numerical Solution of ordinary differential equations using Taylor's series, Euler and Modified Euler's methods, Runge Kutta method of fourth order.	<b>6</b>

**Reference Books:**

1. N.P. Bali and M. Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 2010.
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 2000.
3. T. Veerarajan, "Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2010.
4. Murray Spiegel , "Schaum's Outline of Probability and Statistics", 4th Edition, Tata McGraw-Hill 2012

<b>Sr. No.</b>	<b>Examination</b>	<b>Module</b>
1	T – I	1 , 2 and part of 3
2	T – II	Remaining part of 3, 4 and part of module 5
3	Final exam	1 to 7

**Course Objectives:**

1. Introduce power amplifiers and frequency response of op-amp and FET.
2. Introduction and application of 555timer and voltage regulator.
3. Introduce active filters.
4. Discuss negative feedback amplifiers and oscillators

**Course Outcomes:** Students will demonstrate the ability to

1. Design power amplifier to meet the desired requirement.
2. Illustrate the functions of basic building blocks of 555 timer
3. Design voltage regulators.
4. Compare circuits using negative feedback.
5. Design active filters and to select appropriate components to design oscillator

**Course Contents:**

<b>Module</b>	<b>Details</b>	<b>Hours</b>
<b>1</b>	Power Amplifiers: Introduction to different types of Large signal amplifiers viz. Class A, B, AB, C	<b>05</b>
<b>2</b>	Frequency response: BJT and op-amp.	<b>05</b>
<b>3</b>	555timer: Introduction to the block diagram, Applications: a stable and mono Stable multi vibrator with applications of each.	<b>05</b>
<b>4</b>	Voltage regulator: FixedVotageregulator:78XX,79XX,AdjustableVotageregulator:723	<b>07</b>
<b>5</b>	Active Filters: First and Second order LP, HP, BP & band reject filters.	<b>05</b>
<b>6</b>	Feedback amplifiers(Negative Feedback): Introduction to negative and positive feedback, Negative feedback Current, Voltage: Series and Shunt type Effect of Negative feedback on: Input impedance, output impedance Voltage gain, current gain and bandwidth	<b>08</b>
<b>7</b>	Oscillators: Frequency of oscillation, Condition for maintenance of oscillations of: (i) RC phase shift (ii)Wien Bridge, Crystal oscillator.	<b>07</b>

**Text/ Reference Books:**

1. Robert Boylestad and Louis Nashelsky, „Electronic devices and circuits“, Prentice HallofIndia, London

2. Donald A. Neamen, "Electronic Circuit Analysis and Design", Tata McGraw-Hill publishing Company Limited.
3. D. Roy Choudhari and Shail B. Jain, "Linear Integrated Circuits", New age International Publishers.
4. Gayakwad Ramakant, "Op-Amps and Linear Integrated Circuits", PHI publication
5. Bhargava, Kulshreshtha, Gupta, "Basic Electronics and Linear Circuits", TTTI Chandigarh, Tata McGraw Hill, New Delhi.
6. K.R. Botkar, "Integrated Circuits", Khanna Publication.
7. David Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press
8. Allen Mottershead, "Electronic Devices and Circuits an introduction", Prentice Hall of India.

<b>Sr. No.</b>	<b>Examination</b>	<b>Modules</b>
<b>1</b>	<b>Test 1</b>	<b>1,2,3</b>
<b>2</b>	<b>Test 2</b>	<b>4,5</b>
<b>3</b>	<b>End Semester</b>	<b>1-7</b>

**Course Code: PC-BTE402      Course:-Electrical and Electronics Measurements**

**(AY 2019-20)**

**Prerequisite: Courses: Electronic Circuits and Digital Electronics**

**Course Objectives:**

1. Detailed study of analog measurement instruments.
2. Understanding of time, voltage, frequency and ratio metric digital measurement techniques.
3. Introduction to transducer and instrument transformer

**Course Outcomes: :** Students will demonstrate the ability to

1. Select appropriate measuring technique and instrument for measurement of desired parameter/quantity.
2. Explain operating principles of electronic measuring instruments.
3. Compute the errors in measuring instrument
4. Appreciate operating principles of digital measuring instruments

**Course Contents:**

<b>Module</b>	<b>Details</b>	<b>Hours</b>
<b>1</b>	Standards of measurements Analog Measuring instruments General features of indicating, recording and integrating type of instruments, Working Principles of analog instruments, Megger, Bridge measurements Wheatstone bridge, Maxwell's bridge.	<b>06</b>
<b>2</b>	Digital time measurement: Measurement of time interval between 2 events, resolution, Measurement of time interval with constraint, Measurement of periodic time, Capacitance measurement, Phase measurement, Measurement of time interval between 2 events defined by Voltage levels, Time constant measurement. Digital frequency measurement: High frequency measurement, Power system frequency Deviation measurement, Peak frequency measurement, Fast low frequency Measurement of sinusoidally varying signal	<b>10</b>
<b>3</b>	Digital Voltage measurement: Sampling theorem, Time division multiplexing, Quantization, Indirect type A/D converter, Voltage to frequency converters, Direct type analog to digital converters, Input circuitry of digital voltmeter	<b>06</b>
<b>4</b>	Digital ratio metric measurements: Ratiometric measurement techniques, applications, Digital ohmmeter, Digital Capacitance meter, Frequency meter for sinusoidal signals, Digital quality factor meter	<b>03</b>
<b>5</b>	Instrument transformers: Theory of Current and potential transformers, Definition importance and applications, Definition of	<b>06</b>

	ratio and phase angle errors	
<b>6</b>	Transducers: Measurement of vibration, velocity, flow, level, Photoelectric, strain gauge and measurement of strain performance, Characteristics and selection for given Application	<b>06</b>
<b>7</b>	Calibration of Instruments and Safety in instrumentation: Need of Instrument Calibration, Preparation for calibration, Standard calibration procedure, Five point calibration procedure, Safety in instrumentation.	<b>05</b>

**Text/ Reference Books:**

1. T.S. Rathore „Digital measurement techniques“ by Narosa Publishing house.
2. Sawhney. A.K. „A course in Electrical and electronics measurements and Instrumentation by Dhanpat Rai and Sons 17<sup>th</sup> edition 2007.
3. Kalsi H.S. “Electronic Instrumentation”, Tata McGraw Hill, 3rd edition1997.
4. Doebelin E.O „Measurement system application and design“, Tata McGraw Hill, 4th edition1990.

<b>Sr. No.</b>	<b>Examination</b>	<b>Modules</b>
<b>1</b>	<b>Test 1</b>	<b>1. Part of 2</b>
<b>2</b>	<b>Test 2</b>	<b>Part of 2, 3, 4</b>
<b>3</b>	<b>End Semester</b>	<b>01-07</b>

**Course Objectives:**

1. To introduce the concepts of signals and systems.
2. To discuss different analysis tools (Fourier Series, Fourier Transform, Laplace Transform and Z Transform) and their properties.
3. To carry out analysis and synthesis of both continuous-time and discrete time systems both in time domain and transformed domain using different transforms and applied mathematics concepts

**Course Outcomes: :** Students will demonstrate the ability to

1. Understand and characterize CT and DT signals and systems.
2. Analyze CT and DT systems in Time domain using convolution.
3. Represent CT signals in the Frequency domain using Fourier analysis tools, CTFS and CTFT.
4. Analyze CT system using Fourier and Laplace transform.
5. Evaluate Z-Transform of a given function and Analyze DT systems using Z Transform.

**Course Contents:**

<b>Module</b>	<b>Details</b>	<b>Hours</b>
<b>1</b>	Introduction to Signals and Systems Introduction: Basics, need, advantages, limitations, applications, etc. Definition and basic signals such as impulse, unit step, unit ramp. Classification of signals. Signal operations. Concept of a Continuous time (CT) and Discrete time(DT) system, properties and classification of systems. Examples of continuous-time and discrete-time system models, modeling of electrical circuit models such as RL circuit. Analog to digital conversion of signal	<b>06</b>
<b>2</b>	Discrete time LTI Systems Introduction FIR and IIR Systems. Discrete convolution, properties of convolution. Correlation of two signals Solution of linear constant coefficient difference equation: Zero input and zero state response.	<b>06</b>
<b>3</b>	CT Fourier Series and Fourier Transform Introduction, Trigonometric Fourier Series, Dirichlet's conditions Complex exponential form of Fourier Series, Parseval's theorem for Fourier Series , Power Spectrum of a Periodic Function , Fourier Transform, energy spectrum, Properties of Fourier Transform such as Linearity, Symmetry, Scaling, Convolution, Time shifting, Frequency shifting, Fourier transform of some important signals such as rectangular, triangular, exponential, Gaussian pulse. System analysis of CT system, frequency response of a CT system.	<b>06</b>

<b>4</b>	Applications of Laplace Transform to System Analysis Introduction Definition, ROC, Laplace Transform of important functions, Initial and Final value theorem, Partial fraction expansions , Network transfer function, step and impulse response, Mapping of s-plane poles and zeros, stability in s-domain, Laplace transform of periodic functions,	<b>06</b>
<b>5</b>	z-Transforms Introduction , Definition, one sided and two sided z-transform, ROC, Properties of ROC, z-plane. Properties of z-transform. Inverse z-transform using methods such as long division, partial fraction expansion, residue method.	<b>06</b>
<b>6</b>	Analysis of LTI systems using z-transform Solution of linear constant coefficient difference equation using method of z transforms, transfer function, impulse response and step response. Pole zero concepts, stability criterion for systems. Relation between s-plane and z-plane. Inverse system and deconvolution.	<b>06</b>
<b>7</b>	Realization of Linear Systems Basic realization block diagram of CT and DT system. Basic structures for IIR Systems: Direct form – I, direct form – II, series, parallel. Basic structures of FIR Systems	<b>06</b>

**Text/ Reference Books:**

1. Mrinal Mandal and Amir Asif, “Continuous and Discrete Time Signals and Systems”, Cambridge International Student Edition, Tata McGraw-Hill,
2. Nagrath I. J., Sharan S. N. and Ranjan R., “Signal & Systems”.
3. Haykin S and Van Veen B., “Signal & Systems”, Wiley Publication.
4. Alan V. Oppenheim, Alan V. Willsky and S.HamidNawab, “Signals and Systems”, Prentice-Hall India.
5. Narayan Iyer, “Signal & Systems”, Cengage Learning, 2011.

<b>Sr. No.</b>	<b>Examination</b>	<b>Modules</b>
<b>1</b>	<b>Test 1</b>	<b>1,2, part of 3</b>
<b>2</b>	<b>Test 2</b>	<b>Part of 3,4,5</b>
<b>3</b>	<b>End Semester</b>	<b>1-7</b>

**Course Code: PC-BTE404 Course:-Microprocessor and Microcontroller (AY 2019-20)**

**Prerequisite: Course Digital Electronics**

**Course Objectives:**

1. To introduce computer design and classify computer organization.
2. To understand different types of memory used in computer systems.
3. To understand the applications of Microprocessors & Microcontrollers
4. To understand architecture and features of typical Microcontroller.
5. To learn interfacing of real world input and output devices.

**Course Outcomes:** Students will demonstrate the ability to

1. Do assembly language programming.
2. Do interfacing design of peripherals like I/O, A/D, D/A, timer etc.
3. Develop systems using different microcontrollers

**Course Contents:**

<b>Module</b>	<b>Details</b>	<b>Hours</b>
<b>1</b>	Fundamentals of Microprocessors: Fundamentals of Microprocessor Architecture. 8-bit Microprocessor and Microcontroller architecture, Comparison of 8-bit, 16-bit and 32-bit microcontrollers. Definition of embedded system and its characteristics, Role of microcontrollers in embedded Systems. Overview of the 8051 family.	06
<b>2</b>	The 8051 Architecture Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles	06
<b>3</b>	Instruction Set and Programming I Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set,	06
<b>4</b>	Instruction Set and Programming II Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs, C language programs. Assemblers and compilers. Programming and debugging tools.	06
<b>5</b>	Memory and I/O Interfacing Memory and I/O expansion buses, control signals, memory wait states. Interfacing of peripheral devices such as General Purpose I/O, ADC,	08

	DAC, timers, counters, memory devices.	
<b>6</b>	External Communication Interface Synchronous and Asynchronous Communication. RS232, SPI, I2C. Introduction and interfacing to protocols like Blue-tooth and Zig-bee.	05
<b>7</b>	Applications (06 Hours) LED, LCD and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, sensor interfacing.	05

**Text/ Reference Books:**

1. Mano M., “Computer System and Architecture”, Prentice Hall of India , New Delhi.
2. William Stallings, “ Computer Organization and Architecture”, Pearson Education
3. Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8086”, Penram International Publication.
4. Muhammad Ali Mazidi, “The 8051 Microcontrollers and Embedded Systems using Assembly and C”, PHI.
5. Kenneth J. Ayala, “The 8051 microcontroller”, Delmar Cengage Learning.
6. KennethJ.Ayala,“The 8086 Microprocessor: Programming &Interfacing the PC”, Delmar  
3. Publishers.
7. Muhammad Ali Mazidi et al, “PIC Micro Controller and Embedded System”, Pearson Education.
8. A K Ray,K M Bhurchandi, Advanced Microprocessors and Peripherals, TMH.

<b>Sr. No.</b>	<b>Examination</b>	<b>Modules</b>
<b>1</b>	<b>Test 1</b>	<b>1,2</b>
<b>2</b>	<b>Test 2</b>	<b>3,4</b>
<b>3</b>	<b>End Semester</b>	<b>01-07</b>

**Course Objectives:**

1. Discuss the concepts of magnetic field, magnetic circuits, electromagnetic force and torque.
2. Introduce DC machines, transformer.

**Course Outcomes:** Students will demonstrate the ability to

1. Understand the concepts of magnetic circuits.
2. Analyze the differences in operation of different dc machine configurations.
3. Analyze single phase and three phase transformers and high frequency transformer circuits

**Course Contents:**

Module	Details	Hours
1	Magnetic fields and magnetic circuits: Review of magnetic circuits - MMF, flux, reluctance, inductance; review of Ampere Law and Biot Savart Law; Visualization of magnetic fields produced by a bar magnet and a current carrying coil through air and through a combination of iron and air; influence of highly permeable materials on the magnetic flux lines.	08
2	Electromagnetic force and torque: B-H curve of magnetic materials; flux-linkage vs current characteristic of magnetic circuits;	06
3	Linear and nonlinear magnetic circuits; energy stored in the magnetic circuit; force as a partial derivative of stored energy with respect to position of a moving element; torque as a partial derivative of stored energy with respect to angular position of a rotating element.	04
4	DC machines : EMF equation, Armature winding and commutation-lap and wave windings, construction of commutator, linear commutation, Derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.	04
5	DC machine - motoring and generation, Types of field excitations – separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, V-I characteristics and torque-speed characteristics of separately excited Dc machines.	04
6	Transformers: Principle of operation of single phase and three phase transformers, Equivalent circuit, Phasor diagram, O.C. and S.C. test: Efficiency and regulation, Transformer And Vector Groups, Parallel operation of transformers	08
7	Excitation phenomenon in transformers: Transformer harmonics, Oscillating neutral, Transformer switching current transient, Autotransformers, Tap changing transformers. High Frequency Transformers (HFT): Basic Principle - construction – equivalent circuit -different types of HFT– comparison of HFT with conventional power transformers – Application of HFT.	08

**Text / Reference Books:**

2. P.C.Sen, Principles of Electric Machines and Power Electronics Wiley India Pvt Ltd.
3. Nagrath I.J., Kothari D.P., Electric Machines, TMH Publication.
4. P.S.Bimbra, Electrical Machinery , by Khanna Publisher.
5. P.S.Bimbra, Generalized theory of Electrical Machines, Khanna Publisher.

<b>Sr. No.</b>	<b>Examination</b>	<b>Modules</b>
<b>1</b>	<b>Test 1</b>	<b>1, 2</b>
<b>2</b>	<b>Test 2</b>	<b>3,4,5</b>
<b>3</b>	<b>End Semester</b>	<b>1-7</b>

**Course Code: PC-BTE406 Course:-Analog Circuits Laboratory (AY 2019-20)**

**Course Objectives:**

1. Study frequency response of Op-Amp and BJT, oscillators
2. Use IC 555 as mono-stable and a stable multi-vibrator.
3. Introduction to active filters, negative feedback amplifiers.
4. Learn to develop application based on digital electronics circuits

**Course Outcomes:** Students will demonstrate the ability to

1. Compare frequency response of Op-Amp and BJT by plotting it experimentally.
2. Able to select component values for astable and mono-stable multi-vibrators using IC 555
3. Able to use voltage regulators using IC 723, to design active filters and to select appropriate components to design oscillator.
4. Develop managerial skills

**Course Contents:**

Exot. No.	Title	Hours
1	Frequency Response of Op-amp	02
2	Astable multi-vibrator using 555	02
3	Mono-stable multi-vibrator using 555	02
4	Low voltage regulator	02
5	High voltage Regulator	02
6	First order LPF.	02
7	Wein Bridge Oscillator	02
8	RC phase shift Oscillator	02
9	Gain of CE amplifier with and without Feedback (CE bypass Capacitor)	02

Student should complete mini project in a group of 4-5 students. The group has to present the project and submit the project report

**Course Code: PC-BTE407**

**Course:-Electrical and Electronics Measurements Laboratory**

**(AY 2019-20)**

**Course Objectives:**

1. To conduct experiment on calibration of energy meter
2. To understand different in-built Lab view result functions related to signals and system.
3. To validate the theoretical concept.

**Course Outcomes:** Students will demonstrate the ability to

1. Understand construction and working principle of various analog instruments.
2. Understand various measurement techniques used for measurement of various parameters.
3. Apply theoretical knowledge to convert analog signal into digital signal

**Course Contents:**

<b>Expt. No.</b>	<b>Title</b>	<b>Hours</b>
<b>1</b>	To measure the energy consumed by load using analog energy meter and compare the measurement with static energy meter. Wattmeter.	02
<b>2</b>	To study the working of Megger and carry out measurement of insulation resistance.	02
<b>3</b>	To study the working of vibrating reed type frequency meter.	02
<b>4</b>	To study analog to digital conversion using LM0804	20
<b>5</b>	To study the active filters low pass, high pass, band pass and band reject filter.	02
<b>6</b>	To measure input voltage signal using Voltage to Frequency Converter using IC 555	02
<b>7</b>	To study the working principle and constructional details of Electrodynamometer	02
<b>8</b>	To study the operation and working of the thermocouple.	02

**Course Code: PC-BTE408 Course:-Microprocessor and Microcontroller Laboratory**  
**(AY 2019-20)**

**Course Objectives:**

1. Study of instruction set an architecture of microprocessor and Microcontroller
2. Study of external interface
3. Learn to develop application using microprocessor/ microcontroller

**Course Outcomes:** Students will demonstrate the ability to

1. Apply instruction set of microprocessor and Microcontroller
2. Interface with external devices
3. Develop managerial skills

**Course Contents:**

<b>Expt. No.</b>	<b>Title</b>	<b>Hours</b>
<b>Microprocessor</b>		
1	Addition of Two 8-bit Numbers and Sum is 8-bit.	02
2	Addition of two 8 bit numbers and sum is 16-bit.	
3	Addition of Two 16-Bit Numbers and Sum is 16-bit.	
4	Decimal Addition of Two 8-Bit Numbers and Sum is 8-bit.	02
5	One's Complement and Two's Complement of an 8-bit Number	
<b>Microcontroller</b>		
6	To add and subtract two 8 bit numbers using registers....	02
7	To multiply and divide two 8 bit numbers using register	
8	Addition and subtraction of two numbers using DPTR	02
9	Multiply and divide two numbers using DPTR	
10	Count number of ones in given 8 bit number	01
11	To perform read and write operation by 8255 interfacing	02
12	Interfacing of microcontroller to seven segment display.	02
13	Interfacing of microcontroller to LCD display	02
14	Mini project	

Student should complete mini project in a group of 4-5 students. The group has to present the project and submit the project report

**Course Code: PC-BTE409 Course:-Electrical Machines I Laboratory (AY 2019-20)**

**Course Objectives:**

1. Study construction of DC motor and transformer..
2. Conduct experiment to learn open circuit and short circuit test on 1 phase and 3 Phase Transformer.
3. Conduct experiment to perform load test on DC shunt motor and transformer.
4. Learn speed control techniques of DC shunt & series motor.
5. Learn concepts of electromagnetics through simulations

**Course Outcomes:** Students will demonstrate the ability to

1. Understand the performance characteristics of DC shunt and Series motors
2. Understand the equivalent circuit parameters of transformer.
3. Observe the effect of load variation on the performance of DC motor and transformer
4. Understand and apply concepts of electromagnetics

**Course Contents:**

<b>Expt No.</b>	<b>Title</b>	<b>Hours</b>
<b>1</b>	Demonstration on construction of transformer and DC machines	<b>02</b>
<b>2</b>	To perform load test on DC Shunt Motor.	<b>02</b>
<b>3</b>	To study speed control of DC Shunt Motor.	<b>02</b>
<b>4</b>	Simulation 1 based on Magnetic fields and magnetic circuits	<b>02</b>
<b>5</b>	Simulation 2 based on Electromagnetic force and torque	<b>02</b>
<b>6</b>	To study speed control of DC Series Motor.	<b>02</b>
<b>7</b>	To perform open circuit and short circuit test on 1 Phase Transformer	<b>02</b>
<b>8</b>	To perform load test on 1 Phase Transformer	<b>02</b>
<b>9</b>	To perform open circuit and short circuit test on 3 Phase Transformer	<b>02</b>
<b>10</b>	To study parallel operation of two single phase transformer.	<b>02</b>

**Course Code: MC-BTE02 Course:-Indian Traditional Knowledge (AY 2019-20)**

**Course Pre-requisites:** - Higher Secondary Education

**Course Objectives:**

The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. The course provides an introduction to Indian Knowledge Systems, Indian perspective of modern scientific world-view, and basic principles of Yoga and holistic health care system. The course also provides offers an overview of Indian philosophical traditions, Indian linguistic Tradition, and Indian artistic tradition.

**Course Outcomes:**

On successful completion of this course the students will be able to

1. Explain basics of Indian tradition and Indian traditional knowledge systems.
2. Describe basics of Indian traditional health care, technologies and its scientific perspectives.
3. Explain basics of Indian artistic, linguistic and philosophical tradition.
4. Co-relate the Indian traditional knowledge in modern scientific perspective.

**Course Contents:**

<b>Sr. No.</b>	<b>Description</b>	<b>Duration (hrs.)</b>
1	<b>Indian Tradition:</b> Fundamental unity of India, India's heroic role in world civilization, The Indian way of life, Introduction to Indian tradition, The Scientific Outlook and Human Values.	06
2	<b>Basic structure of Indian Knowledge System:</b> Indian Traditional Scriptures, Exposure to 4-Vedas, 4-Upvedas (Ayurveda, Dhanurveda, Gandharvaveda, Sthapatya etc.), 6-Vedangas (Shiksha, Kalp, Nirukta, Vyakaran, Jyotish), 6-Upangas (Dharmashastra, Meemansa, Puranas, Tarkashastra/Logic) etc.	06
3	<b>Indian Knowledge System and Modern Science:</b> Relevance of Science and Spirituality, Science and Technology in Ancient India, Superior intelligence of Indian sages and scientists.	06
4	<b>Indian Traditional Health Care:</b> Importance and Practice of Yoga, Pranayam and other prevailing health care techniques.	06
5	<b>Indian Artistic Tradition:</b> Introduction and overview of significant art forms in ancient India such as painting, sculpture, Civil Engineering, Architecture, Music, Dance, Literature etc.	06
6	<b>Indian Linguistic Tradition:</b> Ancient Indian languages and literary Heritages, Phonology, Morphology, Syntax and Semantics.	06
7	<b>Indian Philosophical Tradition:</b> (Sarvadarshan)- Nyay, Vaishepik, Sankhya, Yoga, Meemansa, Brief understanding of Philosophy of Charvaka, Bhagwan Mahaveer Jain, Bhagwan Buddha, Kabeer, Guru Nanak Dev and other eminent	06

ancient Indian Philosophers.	
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### Term Activities:

The Term Activities will consist of one assignment on each module, group discussions, presentations, case study on various topics based on above curriculum. Required attendances, involvement in academic activities related to course and overall conduct carry weightage.

### Text Books:

1. Ajwani L.H., *Immortal India*, Vora & Co. Publishers, 1997.
2. Swami Jitatmananda, *Modern Physics and Vedanta*, Bharatiya Vidya Bhavan, 2004.
3. Krishnamurthy, V. *Science and Spirituality- A Vedanta Perception*, Bharatiya Vidya Bhavan, 2002.
4. Sharma D.S., *The Upanishadas- An Anthology*, Bharatiya Vidya Bhavan, 1989.
5. Raman V.V., *Glimpses of Indian Heritage*, Popular Prakashan, 1993.

### Reference Books:

1. Sivaramakrishnan, V., *Cultural Heritage of India- Course Material*, Bharatiya Vidya Bhavan, Mumbai 5<sup>th</sup> Edition, 2014.
2. Capra F., *Tao of Physics*, Shambhala, 2010.
3. Chatterjee S.C. and Datta D.M., *An Introduction to Indian Philosophy*, University of Calcutta, 1984.
4. Krishna Chaitanya, *Arts of India*, Abhinav Publications, 1987.
5. Jha V.N., *Language, Thought and Reality*.

Sr. No.	Examination	Module
1	T – I	1, 2
2	T – II	3, 4
3	Final Examination	1-7

## Value Added Courses

### 1. PLC (VA-BTE03)

#### Course Objective:

1. Discuss the purpose, functions, and operations of a PLC
2. Explain basic components of the PLC and how they function

#### Course Outcome: Students will be able to

1. Generate and print out a ladder logic report using PLC software
2. Create a PLC project using PLC
3. Configure the I/O for a PLC project using PLC

**Course content:** 1. Introductions to the purpose, functions, and operations of the PLC, 2. Identification of various components of the PLC, Introduction to PLC ladder logic and basic programming concepts, 3. Establishing communications with the PLC, Definitions of conditional inputs and outputs, Electrical continuity versus logical continuity, 4. PLC timer and counter concepts and programming applications, 5. Programming applications using sequencers.

### 2. Numerical Computations (VA-BTE04)

**Course Objective:** Provide knowledge of various numerical method available for solving engineering problems.

**Course Outcome:** Students will be able to write code for numerical methods to solve engineering problems

**Course content:** Different techniques and programming in C, C++ or MATLAB used for finding 1. roots of equation, 2. solving simultaneous, 3. differential equations, 4. integration, 5. interpolation, optimization methods.

## Value Added Courses by Industry

### Course code: VA- BTI01 Course: Basic Automation – 1 (PLC and HMI) (AY2019-20)

Course Duration: 40 hours

Prerequisite: Basic Knowledge of Automation technology, relay logic essential but not mandatory

Course Objectives : The participants will

1. understand working of PLC
2. understand basic concepts of HMI

Course Outcomes: The participants will be able to

1. use Siemens PLC by understanding installation and by applying the knowledge of programming

Course Contents:

Module	Details
1	<b>Basic constituents of PLC:</b> Signal modules, CPU, Power Supply, mounting rail and MMC
2	<b>Working</b> of PLC, Installation guidelines, powering and wiring of modules with information on addressing.
3	<b>Programming:</b> Programming language and representation in STL,FBD and LAD, Hardware Configuration and setting object Properties of Modules in STEP, Programming instruction: AND, OR, AND-before-OR, OR-before-AND, NO / NC contacts, Edge detection instructions, Set/ Reset, Elementary data type.
4	<b>Overview of SIMATIC S7 – PLC:</b> Programming Units and using PC as Programming Unit, Hardware Configuration and setting object Properties of Modules in STEP, Step 7 Instructions and programming: Set/ Reset, Elementary data type, Load/Transfer, comparison, basic math instructions, Timers/ Counters List etc
5	<b>Using Symbol Table and VAT.</b>