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: 2018-19

List of Courses

Course Code: BS-BTE301 Course:-Applied Mathematics III (AY 2018-19)

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

	Fourier constants, Dirichlet's conditions **Fourier series for** $f(x),\ x \in [c, c+2\pi]$ and $x \in [c, c+2L]$	
4	Fourier Series half range & complex form. Fourier series of Odd and Even functions Half range Fourier Sine & Cosine series, Parseval's Identity Complex form of Fourier series.	05
5	Complex Variables & Mapping Functions of complex variable, Analytic functions, Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic functions, Analytic method and Milne Thomson methods to find f(z), orthogonal trajectories. Conformal mapping, Bilinear transformation, cross ratio, fixed points.	07
6	Matrices Orthogonal, Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian & Unitary matrices and their elementary properties. 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.	06
7	Eigen values & Cayley Hamilton Eigen-values and Eigenvectors of a matrix, Cayley- Hamilton theorem, Function of a matrix, Diagonalization of a matrix	06

Text Books:-

1. B S Grewal (2014), "Higher Engineering Mathematics", Khanna Publications, 43rd Edition, ISBN 8174091955, 1315 Pages

Reference Books:-

1. Erwin Kreyszig (2010), "Advanced Engineering Mathematics" Wiley Eastern Limited, Singapore 10th edition, ISBN 8126554231, 1148 Pages.

2. Text book of Engineering Mathematics , N.P.Bali , Laxmi Publications, 9th edition,ISBN:978-81-318-0832-0

Sr. No.	Examination	Module
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

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

Course Code: PC-BTE301 Course:-Electronic Circuits (AY 2018-19)

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 HallofIndia, London

2. Donald A. Neamen,“ElectronicCircuitAnalysisandDesign”,TataMcGraw-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:‘BasicElectronicsandLinearCircuits’TTTI Chandigarh, Tata McGrawHill, New Delhi.
6. K.R.Botkar,”IntegratedCircuits”,KhannaPublication.
7. DavidBell,‘ElectronicDevicesandCircuits’,5thEdition,OxfordUniversity Press
8. AllenMottershead,“ElectronicDevicesandCircuitsanintroduction”,Prentice Hall of India.

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

Course Code: PC-BTE302 Course:-Electrical Networks (AY 2018-19)

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:

Module	Details	Hours
1	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.	**08**
2	Graph Theory and Network Topology: Concept of Graph of a Network, Tree, co-tree, Incidence, cutest and tie-set matrices, their relation to the Kirchoff's Laws and concept of Duality.	**04**
3	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	**10**
4	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	**06**
5	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	**06**

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

Text/ Reference Books:

1. M.E. Van Valkenburg: Network Analysis. Prentice-Hall of IndiaPvt. 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.

Sr. No.	Examination	Modules
1	**Test 1**	**1,2**
2	**Test 2**	**3, 4**
3	**End Semester**	**1-7**

Course Code: PC-BTE303 Course:-Digital Electronics (AY 2018-19)

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:

Module	Details	Hours
1	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	**06**
2	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	**06**
3	Combination Logic Circuit Design: (i) Adders, Subtractors (Half and Full), carry look ahead adder, serial adder, magnitude comparators (ii) (ii) Arithmetic logic units, multiplexers, demultiplexers parity encoder, code converter, Hazards in Combinational circuits.	**07**
4	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.	**08**
5	Registers: SISO, SIPO, PISO, PIPO registers, pseudorandom sequence generator.	**05**
6	Logic Families: Characteristics of digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic	**05**
7	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	**05**

	Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).	

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.

Sr. No.	Examination	Modules
1	**Test 1**	**1,2,3(i)**
2	**Test 2**	**3(i),4**
3	**End Semester**	**01-07**

Course Code: PC-BTE304 Course:-Electrical Machines I (AY 2018-19)

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 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;	04
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 : Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation – Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.	08
5	DC machine - motoring and generation: Armature circuit equation for motoring and generation, Types of field excitations - separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. V-I characteristics and torque-speed characteristics of separately excited,	**06**
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	**06**

7	Excitation phenomenon in transformers: Transformer harmonics, Oscillating neutral, Transformer switching current transient, Autotransformers, Tap changing transformers	**06**

Text / Reference Books:

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

Sr. No.	Examination	Modules
1	**Test 1**	**1, 2**
2	**Test 2**	**3,4**
3	**End Semester**	**1-7**

Course Code: PC-BTE305 Course:-Electronic Circuit Laboratory (AY 2018-19)

Course Objectives:

1. Understand diode as a Clipper and Clamper.
2. Learn characteristics of transistors
3. Understand working of Differential amplifier.
4. Learn practical applications of Op-amp.
5. Learn instrumentation amplifier.

Course Outcomes: Students will demonstrate the ability to

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

Course Contents:

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

Course Code: PC-BTE306 Course:-Digital Electronics Laboratory (AY 2018-19)

Course Objectives:

1. Understand the basics of circuit making on bread board
2. Test the working of the circuit
3. Introduce simulation using software

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.

Course Contents:

Expt No	Title	Hours
1	Logic Expressions simplification and implementation.	**02**
2	Half Adder and Half subtractor using gate IC's	**02**
3	Code Converter: Binary to Gray, BCD to XS-3.	**02**
4	IC7483 as 4bit adder and subtractor	**02**
5	Multiplexer 4:1 using gates.	**02**
6	De-multiplexer1:16usingTINAsoftware.	**02**
7	Flip-Flops: S-R,J-K,D, T using only NAND gates.	**02**
8	BCD Counter	**02**
9	Ring Counter, Twisted Ring Counter.	**02**
10	PLD Simulation	**02**

Course Code: PC-BTE307 Course:-Electrical Machines I Laboratory (AY 2018-19)

Course Objectives:

1. To study construction of DC motor and transformer..
2. To conduct experiment to learn open circuit and short circuit test on 1 phase and 3 Phase Transformer.
3. To conduct experiment to perform load test on DC shunt motor and transformer.
4. To learn speed control techniques of DC shunt & series motor.

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

Course Contents:

Expt No.	Title	Hours
1	Demonstration on construction of transformer and DC machin**es**	**02**
2	To perform load test on DC Shunt Motor.	**02**
3	To study speed control of DC Shunt Motor.	**02**
4	To study speed control of DC Series Motor.	**02**
5	To perform open circuit and short circuit test on 1 Phase Transformer	**02**
6	To perform load test on 1 Phase Transformer	**02**
7	To perform open circuit and short circuit test on 3 Phase Transformer	**02**
8	To study parallel operation of two single phase transformer.	**02**

Course Code: HSM-BTE301

Course:- Organizational Communication and Interpersonal Skills

(AY 2018-19)

Course Objective:

1. To inculcate in students professional and ethical attitude, effective communication skills, team work, interpersonal Skills, and an ability to understand social responsibilities with multi- disciplinary approach.
2. To enable students to communicate in professional and social context with knowledge of business etiquettes.
3. To prepare students for successful career that meets the corporate, industrial and global requirement
4. To help students build an understanding of different organizational cultures, business practices, and social norms to communicate more effectively in domestic and cross-cultural business contexts.
5. To help student's to use a strategic communication model and critical thinking to identify objectives, analyze audiences, and choose the most effective structure and style for delivering strategically sound written and spoken messages.

Course Outcome:

Upon successful completion of this Course learners will be able to

1. Explain principles of effective group communication, so as to cultivate trust and understanding, develop open participation, and strengthen decision making in work groups and teams.
2. Analyse a company's communication processes or key messages and recommend changes that can help advance communication as an integral part of that organization's management strategy and possess entrepreneurial approach for lifelong learning
3. As a team, design and deliver a presentation that both informs and persuades, using an appropriate visual support strategy with leadership skills and adhering to a specified time limit.
4. Participate and succeed in campus placements and display corporate etiquettes
5. Have education necessary for understanding the impact of engineering solutions on society and demonstrate awareness of contemporary issues.

Course Content:

Module	Details	Hrs.
01	**Corporate Etiquettes and Manners and Core Values:** Introduction, Etiquettes and rules of behavior, Professional Conduct, Etiquette in Meetings, Dining Etiquettes.	05
02	**Meetings & Documentations:** Types of meetings, Notice, Agenda, Minutes of the meetings, Strategies for conducting effective meetings.	04

03	**Report writing:** Objectives of report writing, Language and style in a report, Types of reports. **Formats of reports:** Memo, Letter, and Project report Survey based. **Proposal Writing:** Format and style. **Presentation Skills**: A Computer- aided presentation of the Project report. Technical Proposals: Objectives of technical proposals, Parts of proposals.	09
04	**Interpersonal Skills:** Emotional Intelligence, Leadership Skills, Goal Setting and Decision making, Stress Management, Time Management	10
05	**Career Skills:** Group Discussions, Know thy Self (SWOT Analysis), Job Application letter, Writing Effective Resume', Interview Skills.	04

List of Assignments:

1. 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).
2. Technical Proposal (Group activity, document of the proposals)
3. Interpersonal Skills: Case Studies, Group Activity and assignments
4. Two assignments on Career Skills (Cover Letter and Resume' Mock Interviews, Practical sessions)
5. Etiquettes case study and role play.
6. Practical sessions on Group Discussion topics
7. Mock Interviews
8. Presentations on module no. 4 with Power point and role play and videos taken by students.

Distribution of Term Work/ Practical marks shall be as follows: (total 50 marks).

1. Project report presentation : **15 marks**
2. Presentations on Interpersonal topics: **10 Marks**
3. Group Discussion : **10 marks**
4. Attendance**: 05 marks**
5. **Mock Interviews: 10**

Text Books:

1. Lesikar,Flately, Rentz, Pande "Business Communication", Mc Graw Hill, Education Eleventh Edition.

2. R. C. Sharma and Krishna Mohan, "Business Correspondence and Report Writing"

Reference Books:

1. Fred Luthans, "Organisational Behavior", Mc Graw Hill, edition.
2. Huckin and lsen, "Technical Writing and Professional Communication", Mc Graw Hill

3. Wallace and Maters, “Personal Development for Life and Work”, Thomson Learning, 12th edition.
4. Heta Murphy, “Effective Business Communication”, Mc Graw Hill, edition.
5. B.N. Ghosh, “Managing Soft Skills for Personality Development”, Tata McGraw Hill Lehman, Dufrene, Sinha, “BCOM”, Cengage Learning, 2nd edition
6. Bell Smith, “Management Communication” Wiley India Edition, 3rd edition,
7. Dr. K. Alex, “Soft Skills”, S.Chand and Company.

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 Introduction to MATLAB/SCILAB (VL-BTE01)**

   Course Objective: Provide knowledge of MATLAB/ SCILAB.

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

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

2. **Introduction to Python (VL-BTE02)**

   Course Objective: Provide knowledge of Python

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

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

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COURSE CONTENTS

Sem. IV

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

Academic Year: 2018-19

List of Courses

Course Code: BS-BTE401 Course:-Applied Mathematics IV (AY 2018-19)

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:

Module	Details	Hours
1	**Statistics:** Correlation, Karl Pearson coefficient &Spearman's rank Correlation coefficient, linear regression, lines of regression. Curve fitting by the method of least squares.	**8**
2	**Discrete Random Variables:** Random variables, Probability distribution for discrete random variables, Expected value and Variance, Binomial Distribution and Poisson Distribution.	**6**
3	**Continuous Random Variables:** Probability Density Function for continuous random variable, Normal Distribution.	**4**
4	**Sampling Theory:** 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 5mean and population means, Test for significance of the difference b6etween the means of two samples. Test for significance of the dif7ference between sample S.D and population S.D, Test for significance of the difference between the S.D of two samples.	**6**
5	**T-Test:** 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.	**6**
6	**Numerical Methods 1:** Line Solution of polynomial and transcendental	**6**

	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	
7	**Numerical Methods II**: Numerical Solution of ordinary differential equations using Taylor's series, Euler and Modified Euler's methods, Runge Kutta method of fourth order.	**6**

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

Sr. No.	Examination	Module
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 Code: PC-BTE401 Course:-Analog Circuits (AY 2018-19)

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:

Module	Details	Hours
1	Power Amplifiers: Introduction to different types of Large signal amplifiers viz. Class A, B, AB, C	**05**
2	Frequency response: BJT and op-amp.	**05**
3	555timer: Introduction to the block diagram, Applications: a stable and mono Stable multi vibrator with applications of each.	**05**
4	Voltage regulator: FixedVoltageregulator:78XX,79XX,AdjustableVoltageregulator:723	**07**
5	Active Filters: First and Second order LP, HP, BP & band reject filters.	**05**
6	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	**08**
7	Oscillators: Frequency of oscillation, Condition for maintenance of oscillations of: (i) RC phase shift (ii)Wien Bridge, Crystal oscillator.	**07**

Text/ Reference Books:

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

2. Donald A. Neamen,“ElectronicCircuitAnalysisandDesign”,TataMcGraw-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:‘BasicElectronicsandLinearCircuits’TTTI Chandigarh, Tata McGrawHill, New Delhi.
6. K.R.Botkar,”IntegratedCircuits”,KhannaPublication.
7. DavidBell,‘ElectronicDevicesandCircuits’,5thEdition,OxfordUniversity Press
8. AllenMottershead,“ElectronicDevicesandCircuitsanintroduction”,Prentice Hall of India.

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

Course Code: PC-BTE402 Course:-Electrical and Electronics Measurement

(AY 2018-19)

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:

Module	Details	Hours
1	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.	**06**
2	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	**10**
3	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	**06**
4	Digital ratio metric measurements: Ratiometric measurement techniques, applications, Digital ohmmeter, Digital Capacitance meter, Frequency meter for sinusoidal signals, Digital quality factor meter	**03**
5	Instrument transformers: Theory of Current and potential transformers, Definition importance and applications, Definition of	**06**

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

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 17th edition 2007.
3. Kalsi H.S. "Electronic Instrumentation", Tata McGraw Hill, 3rd edition1997.
4. Doeblin E.O 'Measurement system application and design', Tata McGraw Hill, 4th edition1990.

Sr. No.	Examination	Modules
1	**Test 1**	**1. Part of 2**
2	**Test 2**	**Part of 2, 3, 4**
3	**End Semester**	**01-07**

Course Code: PC-BTE403 Course:-Signals and Systems (AY 2018-19)

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:

Module	Details	Hours
1	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	**06**
2	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.	**06**
3	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.	**06**

4	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,	**06**
5	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.	**06**
6	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.	**06**
7	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	**06**

Text/ Reference Books:

1. Mrinal Mandal and Amir Asif, "Continous and Discrete Time Signals and Systems", Cambrige 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.

Sr. No.	Examination	Modules
1	**Test 1**	**1,2, part of 3**
2	**Test 2**	**Part of 3,4,5**
3	**End Semester**	**1-7**

Course Code: PC-BTE404 Course:-Microprocessor and Microcontroller (AY 2018-19)

Prerequisite: Course Integrated Circuits

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:

Module	Details	Hours
1	Fundamentals of Microprocessors: Fundamentals of Microprocessor Architecture. 8-bitMicroprocessor 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
2	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
3	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
4	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
5	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.	
6	External Communication Interface Synchronous and Asynchronous Communication. RS232, SPI, I2C. Introduction and interfacing to protocols like Blue-tooth and Zig-bee.	05
7	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.

Sr. No.	Examination	Modules
1	**Test 1**	**1,2**
2	**Test 2**	**3,4**
3	**End Semester**	**01-07**

Course Code: PC-BTE405 Course:-Analog Circuits Laboratory (AY 2018-19)

Course Objectives:

1. Study frequency response of Op-Amp and BJT.
2. Use IC 555 as mono-stable and a stable multi-vibrator.
3. Introduction to active filters.
4. Understand negative feedback amplifiers.
5. Learn oscillators.

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.
4. Able to design active filters and to select appropriate components to design oscillator.

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

Course Code: PC-BTE406

Course:-Electrical and Electronics Measurements Laboratory

(AY 2018-19)

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:

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

Course Code: PC-BTE407 Course:-Microprocessor and Microcontroller Laboratory (AY 2018-19)

Course Objectives:

1. Study of instruction set an architecture of microprocessor and Microcontroller
2. Study of external interface

Course Outcomes: Students will demonstrate the ability to

1. Apply instruction set of microprocessor and Microcontroller
2. Interface with external devices

Course Contents:

Expt. No.	Title	Hours
	Microprocessor	
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	
	Microcontroller	
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	

Course Code: BS-BTE402 Course:-Medical Electronics (AY 2018-19)

Course Objectives:

1. Discuss bioelectric potentials generated in human body
2. Understand the basic principle, working and design of various automated diagnostic equipments.
3. To study various medical instrumentation systems, drug delivery systems and health management systems.

Course Outcomes: Students will demonstrate the ability to

1. Understand bioelectric potentials generated in human body
2. Use modern methodologies, multi-disciplinary skill set and knowledge while working on real time projects that demand convergence of engineering, science and technology.

Course Contents:

Module	Details	Hrs.
1	Generation of Bioelectric Potentials: Basic cell physiology, Nerve, Muscle, Pacemaker and Cardiac muscle	05
2	Biophysical signal capture, processing and recording systems : Typical medical recording system and general design consideration. Sources of noise in low level recording circuits and their removal techniques. ECG, EMG, EEG	07
3	Patient Monitoring System: Measurement of Heart Rate, Pulse rate, Blood pressure, Temperature and Respiration rate, Apnea Detector. Electrical Safety in Biophysical Measurements. Heart rate variability measurement and applications.	07
4	Arrhythmia and Ambulatory Monitoring Instruments: Cardiac Arrhythmias, waveforms and interpretation from them. Stress test measurement. Ambulatory monitoring instruments-Holter monitor	07
5	Biotelemetry, Telemedicine concepts and its application	02

Text/ Reference Books:

1. Handbook of Biomedical Engineering by R.S. Khandpur, PHI
2. Medical Instrumentation, Application and Design by J.G. Webster, TMH.
3. Encyclopaedia of medical devices and instrumentation - J.G. Webster Vol I, II, III, IV (John Willey).

Sr. No.	Examination	Module
1	T – I	1, 2
2	T – II	3, Part of 4
3	End Semester	1-5

Course Code: MC-BT002 Course:-Indian Traditional Knowledge (AY 2018-19)

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:

Sr. No.	Description	Duration (hrs.)
1	**Indian Tradition:** 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	**Basic structure of Indian Knowledge System:** 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	**Indian Knowledge System and Modern Science:** Relevance of Science and Spirituality, Science and Technology in Ancient India, Superior intelligence of Indian sages and scientists.	06
4	**Indian Traditional Health Care:** Importance and Practice of Yoga, Pranayam and other prevailing health care techniques.	06
5	**Indian Artistic Tradition:** Introduction and overview of significant art forms in ancient India such as painting, sculpture, Civil Engineering, Architecture, Music, Dance, Literature etc.	06
6	**Indian Linguistic Tradition:** Ancient Indian languages and literary Heritages, Phonology, Morphology, Syntax and Semantics.	06
7	**Indian Philosophical Tradition:** (Sarvadarshan)- Nyay, Viaishepik, 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.	

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 5th Edition, 2014.
2. Capra F., Tao of Physics, Shambhala, 2010.
3. Chaterjee 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. P**LC (VL-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: Introductions to the purpose, functions, and operations of the PLC, Identification of various components of the PLC, Introduction to PLC ladder logic and basic programming concepts, Establishing communications with the PLC, Definitions of conditional inputs and outputs, Electrical continuity versus logical continuity, PLC timer and counter concepts and programming applications, Programming applications using sequencers.

2. **Numerical Techniques and Programming (VL-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 roots of equation, solving simultaneous, differential equations, integration, interpolation, optimization methods.