Dr. Babasaheb Ambedkar Technological University, Lonere.

Dr. Babasaheb Ambedkar Technological University

(Established as a University of Technology in the State of Maharashtra)

(under Maharashtra Act No. XXIX of 2014)

P.O. Lonere, Dist. Raigad, Pin 402 103, Maharashtra

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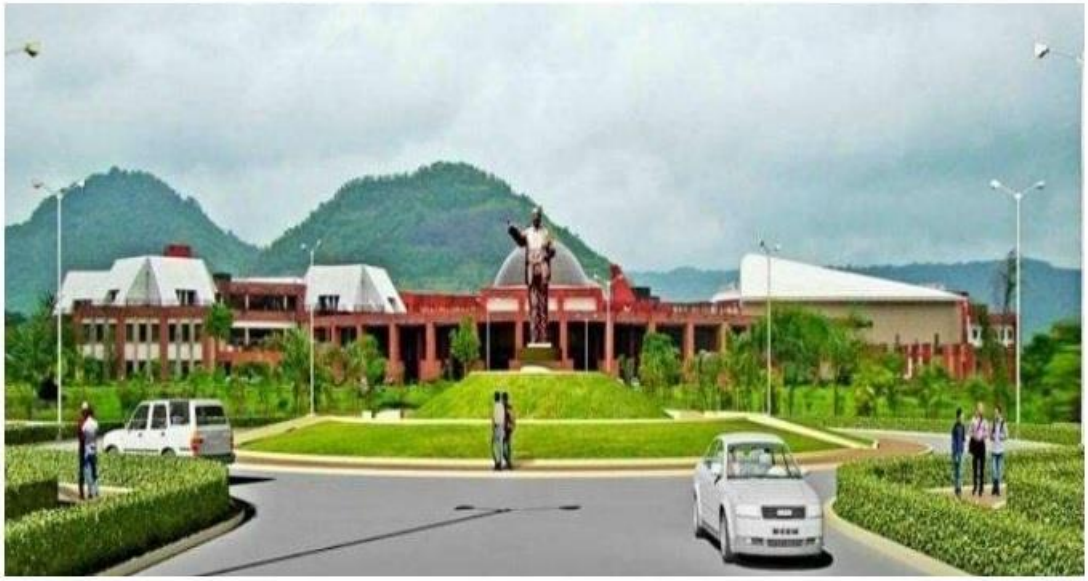
www.dbatu.ac.in

COURSE STRUCTURE AND SYLLABUS

for

Second Year B. Tech. Electrical and Computer Engineering

With effect from the Academic Year 2023-24



Dr. Babasaheb Ambedkar Technological University, Lonere

B. Tech Electrical and Computer Engineering

Curriculum of Second Year

Sem-III

Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
			L	T	P	CA	MSE	ESE	Total	
BSC1	BTBSEC301	Engineering Maths-III	3	1	-	20	20	60	100	**4**
PCC1	BTECC302	Electrical Machines-I	3	1	-	20	20	60	100	**4**
PCC2	BTECC303	Electrical and Electronics Measurement	3	-	-	20	20	60	100	**3**
PCC3	BTECC304	Data Structure using CPP	3	-	-	20	20	60	100	**3**
BSC2	BTBSEC305	Analog and Digital Electronics	3	1	-	20	20	60	100	**4**
HSSMC	BTHM306	Basic Human Rights	2	-	-	-	-	-	-	**Audit**
LC	BTECL307	Electrical Machines-I Lab	-	-	2	60	-	40	100	**1**
LC	BTECL308	Electrical and Electronics Measurement Lab	-	-	2	60	-	40	100	**1**
LC	BTECL309	Data Structure using CPP Lab	-	-	2	60	-	40	100	**1**
Internship	BTES211P	Internship-I Evaluation	-	-	-	-	-	50	50	**1**
			17	3	6	280	100	470	850	**22**

Sem-IV

Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				Credit
			L	T	P	CA	MSE	ESE	Total	
PCC4	BTECC401	Network Theory	3	1	-	20	20	60	100	**4**
PCC5	BTECC402	Power System-I	3	-	-	20	20	60	100	**3**
PCC6	BTECC403	Electrical Machines-II	3	1	-	20	20	60	100	**4**
PEC1	BTECPE404	Group A	3	-	-	20	20	60	100	**3**
PCC7	BTECC405	Computer Architecture and Operating System	3	-		20	20	60	100	**3**
LC	BTECL406	Electrical Machines-II Lab	-	-	2	60	-	40	100	**1**
LC	BTECL407	Python Programming Lab	1	-	2	60	-	40	100	**2**
LC	BTECL408	Power System-I Lab			2	60	-	40	100	**1**
Seminar	BTECS409	Seminar	-	-	2	60	-	40	100	**1**
Internship	BTECP410	Internship-II (Minimum of 4 weeks which can be completed partially in 3rd or 4th Sem or in at one time)	-	-	-	-	-	-	-	**Credit to be evaluated in 5th Sem**
			16	2	8	340	100	460	900	**22**

BTECPE404 **Group A (Professional Elective)**

(A) Computer Algorithm

(B) Competitive Programming

(C) Numerical Methods and Programming

Course with Code: Engineering Maths-III (BTBSEC301)	**Semester-III**
Teaching Scheme Theory: 03 hrs/week Tutorial: 01 hr/week Credits: 04	**Examination Scheme** Mid Semester Exam: 20 Marks Internal Assessment: 20 Marks End Semester Exam: 60 Marks

Course Contents

Unit I: Laplace Transforms **(7 hrs)**

Definition, transforms of elementary functions, properties of Laplace transform, transforms of derivative and integral, Inverse Laplace transforms, Inverse Laplace transforms by using partial fractions and convolution theorem, transforms of periodic functions and Heaviside unit step function, Solution of linear differential equations with constant coefficients by Laplace transform method.

Unit II: Fourier Transform **(7 hrs)**

Fourier Integral Theorem, Fourier Transform, Fourier Sine Transform, Fourier Cosine Transform, Properties of Fourier Transform, Transform of simple functions, Convolution Theorem, Parseval's Identity.

Unit III: Z-Transform **(7 hrs)**

Z-Transforms of basic discrete functions, Region of Convergence Change of scale property, Shifting Theorems, Convolution Theorem Initial Value Theorem, Final Value Theorem, Inverse Z-Transform: Expansion Method, Partial Fraction Method, Method of Residue.

Unit IV: Statistics **(7 hrs)**

Measures of central tendency, Measures of dispersion, Coefficient of variation, Moments, Skewness and Kurtosis, Curve fitting: fitting of straight line, parabola and related curves, Correlation and Regression, Reliability of Regression Estimates.

Unit V: Probability Theory **(7 hrs)**

Introduction, Theorems on Probability, Bayes theorem, Random variables, Mathematical Expectation, Probability density function, Probability distributions: Binomial, Poisson, Normal

Text Books

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.

2. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. PVT. Ltd., New Delhi.

3. A course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai.

4. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.

Reference Books

1. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.

2. A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia Pte Ltd., Singapore.

3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata McGraw-Hill Publishing Company Ltd., New Delhi.

4. Integral Transforms and their Engineering Applications by Dr. B. B. Singh, Synergy. Knowledge ware, Mumbai.

5. A Text Book of Applied Mathematics, Vol. I, Vol. II and vol. III by P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.

Course with Code: Electrical Machines-I (BTECC302)	**Semester-III**
Teaching Scheme Theory: 03 hrs/week Tutorial: 01 hr/week Credits: 04	**Examination Scheme** Mid Semester Exam: 20 Marks Internal Assessment: 20 Marks End Semester Exam: 60 Marks

Course Contents

Unit I: Single Phase Transformer **(9 hours)**

Transformer construction, Ideal and practical transformer, exact and approximate equivalent circuits, no load and on load operation, phasor diagrams, power and energy efficiency, voltage regulation, parallel operation, effect of load on power factor, OC and SC test, direct loading method, switching transients, Auto transformers, Variable frequency transformer, voltage and current transformers. welding transformers, Pulse transformer and applications.

Unit II: Three Phase Transformers **(9 hours)**

Constructional features of three phase transformers, cooling methodology, Standard and special transformer connections, Phase conversion, Parallel operation of three phase transformers, three winding transformers and its equivalent circuit, on load tap changing of transformers, Modern trends in transformers, Type and routine tests, Standards.

Unit III: DC Generators **(9 hours)**

Construction of armature and field systems, Working, types, emf equation, Armature windings, Characteristics and applications, building of emf, Armature reaction - Demagnetizing and Cross magnetizing MMFs and their estimation; Remedies to overcome the armature reaction, Commutation process, Causes of bad commutation and remedies.

Unit IV: D.C. Motors **(9 hours)**

Principles of working, Significance of back emf, Torque Equation, Types, Characteristics and Selection of DC Motors, Starting of DC Motors, Speed Control, Losses and Efficiency, Condition for Maximum Efficiency, Braking of DC Motors, Effect of saturation and armature reaction on losses; Applications, Permanent Magnet DC Motors, Type and Routine test.

Unit V: Special Machines **(6 hours)**

Constructional details of reluctance machine, variable-reluctance machines, basic VRM analysis, practical VRM analysis, stepper motors and their analysis, Brushless DC motors.

Text Books:

1. J. B. Gupta, “Theory and Performance of Electrical Machines,” S. K. Kataria & Sons, New Delhi

2. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers

3. B. L. Theraja, A. K. Theraja, “A text book of Electrical Technology,” S. Chand Publishers

4. Asfaq Hussein, “Electric Machines,” Danpat Rai Publisher

5. V. K. Mehata, Rohit Mehata, “Principles of Electrical machines,” S. Chand Publishers

Reference Books:

1. Bhattacharya S. K, “Electrical Machines,” (Tata McGraw Hill Publications)

2. Kothari Nagrath, “Electrical Machines,” (Tata McGraw Hill Publications)

3. M. N. Bandopadhyay, “Electrical Machines,” (Tata McGraw Hill Publications)

4. Fitzaralda, “Electrical Machines,” (Tata McGraw Hill Publications)

Course with Code: Electrical and Electronics Measurement (BTECC303)	**Semester-III**
Teaching Scheme Theory: 03 hrs/week Credits: 03	**Examination Scheme** Mid Semester Exam: 20 Marks Internal Assessment: 20 Marks End Semester Exam: 60 Marks

Course Contents

Unit I: Introduction to Measurement and Instruments **(5 hrs)**

Introduction to Measurement, Methods of Measurements, Block diagram of Measurement System, Instruments, Classification of Instruments, Characteristics of Instruments & Measurement System, Errors in Measurement, Types of Errors in measurements. Calibration, Statistical analysis, Standards.

Unit II: Analog Measurement of Electrical Quantities **(9 hrs)**

Classification of Analog Instruments, Principle of Operation, Operating Torques, Different types of Damping and Control Systems. Types of Instruments: PMMC, Moving Iron, Electro-dynamometer, Induction, Rectifier. Power measurement in AC and DC circuits, Power and Power Factor, Electrodynamometer-type Wattmeter, Induction-type Wattmeter, Power measurement in Three-Phase systems. Power measurement with Instrument Transformers - Potential and Current Transformer, Induction-type Energy Meter, Errors in Induction-type Energy Meters and their compensation, Testing of Energy Meters.

Unit III: A.C. and D.C. Bridges **(7 hrs)**

Measurement Resistance: Wheatstone bridge, Kelvin bridge Method, Kelvin double bridge Method. Measurement Resistance: Ammeter-Voltmeter Method, Loss of charge method, Mega ohm bridge, Megger. Measurement Inductance: Maxwell bridge, Hay's bridge, Anderson bridge, Measurement of Capacitance: Schering bridge, Wien bridge, Localization of Cable Faults: Murray Loop Test, Varley Loop Test, Numerical

Unit IV: Digital Measurement of Electrical Quantities **(7 hrs)**

Concept of Digital Measurement, Block diagram of Digital Instrumentation System, Digital versus Analog Instrument, Digital voltmeter, Digital Frequency Meter, Digital Multimeter,

Digital Tachometer, Harmonic distortion Analyzer, Spectrum Analyzer, Wave analyser, Cathode Ray Oscilloscope (CRO) and applications, Digital Storage Oscilloscopes (DSO), Signal Generator, Q-Meter.

Unit V: Transducers and Signal Conditioning (8 hrs)

Definition, Classification & selection of transducers, Characteristics Transducers for measurement of Displacement (RVDT & LVDT), Speed, Angular Rotation, Force, Torque, Pressure, Strain, Temperature (Thermocouple and RTD), Hall Effect transducer. Data Acquisition Systems – single & multichannel, Signal Conditioning for RTD PT100, Thermistor, Thermocouple etc.

Reference Books/ Text Books:

1. A K Sawhney, "Electrical & Electronic Measurement & Instrument," Dhanpat Rai & Sons.
2. W.D. Cooper, "Electronic Instrument & Measurement Technique", Prentice Hall Int.
3. J.B. Gupta, "Electrical Measurements and Measuring Instruments", S.K. Kataria & Sons.
4. E. W. Golding & F.C. Widdis, "Electrical Measurement &Measuring Instrument", A.H. Wheeler & Co. India
5. Forest K. Harries, "Electrical Measurement", Willey Eastern PVT. Ltd. India.
6. M.B. Stout, "Basic Electrical Measurement" Prentice Hall of India.

Course with Code: Data Structure using CPP (BTECC304)	**Semester-III**
Teaching Scheme Theory: 03 hrs/week Credits: 03	**Examination Scheme** Mid Semester Exam: 20 Marks Internal Assessment: 20 Marks End Semester Exam: 60 Marks

Course Contents

Unit I: Introduction to Object Oriented Programming **(7 Hours)**

Object Oriented Concepts (difference between POP and OOP, concepts of OOP), Basics of C++- (Structure of C++ program, Input and output streams), Dynamic Memory allocation (New and Delete), this pointer, Classes and objects, Access modifiers.

Unit II: OOP and Introduction to Data Structure **(7 Hours)**

Constructors and Destructors, Operator overloading, Inheritance, Polymorphism, virtual function, characteristics of algorithm, program, linear and non-linear data structure, Space Complexity, Time Complexity, Searching, Sorting

Unit III: Stacks and Queue **(7 Hours)**

Introduction, stack and queue as ADT, representation and implementation of stack and queue using sequential allocation, Application of stack for expression evaluation and expression conversion

Unit IV: Linked list **(7 Hours)**

Introduction, Terminologies, Types of Linked List-Single Double, Operations on Single linked list

Unit V: Trees and Graphs **(7 Hours)**

Tree – Introduction, Terminologies, Types – General tree, Binary tree, Binary Search tree, Binary tree traversal, Graphs - Introduction, Terminologies, representation of graphs using adjacency matrix

Text Book:

1. Weiss, “Data structures and algorithms analysis in C++,” Pearson Edu., 4th Edition, 2013

2.E. Balagurusamy, “Object Oriented Programming with C++,” McGraw-Hill Publications, 6th Edition, 2013.

Reference Books:

1. S. Lipschutz, “Data Structures,” McGraw-Hill Publication, Revised 1st Edition, 2014.

2. Y. Langsm, M. Augenstin, A. Tanenbaum, “Data Structure using C and C++,” Prentice Hall India Learning Private Limited, 2nd edition, 1998.

3. Horowitz and Sahani, “Fundamentals of Data Structures,” Universities Press, 2nd Edition, 2008.

4. Robert Lafore, “Object Oriented Programming in C++,” Sams Publishing, 4th Edition, 2001.

5. Dr. B. B. Meshram, “Object Oriented Paradigms with C++ Beginners Guide for C and C++,” SPD Publication, 1st Edition, 2016.

6. Rajesh R. Shukla, “Object-Oriented Programming in C++,” Wiley India Publication, 1stEditio,2008

7. Bjarne Stroustrup, “The C++ Programming Language,” Addison-Wesley Publication, 4th Edition, 2013.

Course with Code: Analog and Digital Electronics (BTBSEC305)	**Semester-III**
Teaching Scheme Theory: 03 hrs/week Tutorial: 01 hr/week Credits: 04	**Examination Scheme** Mid Semester Exam: 20 Marks Internal Assessment: 20 Marks End Semester Exam: 60 Marks

Course Contents

Unit I: Transistor Amplifier **(7 Hours)**

C amplifier, RC coupled amplifier, need a multi stage amplifier, definition of gain bandwidth 3DB bandwidth, effect of cascading on gain and bandwidth, classification of transistor amplifier based on selection of Q point.

Unit II: Operational Amplifier **(7 Hours)**

Block diagram of operational amplifier, IC 741, function of each pin, Ideal and practical Op-Amp, Op-Amp parameters, Op-Amp operating modes, open loop closed loop inverting mode differential mode, Open applications inverting and non-inverting amplifier, adder and subtractor, Integrator and differentiator, Op-Amp filters

Unit III: Number System and Logic Gates **(7 Hours)**

Types of number systems and there inter conversion binary octal decimal and hexadecimal. Basic logic gates and binary arithmetic. binary addition binary subtraction using 1st and 2nd compliment, Advantage of digital technology logic gate families TTL, MOS, CMOS digital IC, IC characteristics, important digital ICs for AND, OR, NOT, NAND gates

Unit IV: Combinational Systems **(7 Hours)**

Minimization techniques- SOP and POS logical expressions mean term Max term, simplification of logical expressions using K map, combinational logic circuits like half adder full adder, subtractor, IC multiplexer, demultiplexer, encoders and decoders

Unit V: Sequential Systems **(7 Hours)**

Sequential circuits like latches, RS flip flop, JK flip flop, D flip flop, and T flip flop, Registers, counters- modulus counters synchronous and asynchronous counters.

Text/Reference Books:

1. Mandal, "Digital Electronics: Principles and Applications," TMH 2009.
2. Leach, "Digital Principles and Applications", ed. 7, TMH, 2008.
3. M. Morris Mano, "Digital Logic and Computer Design," Pearson Edu. 2014.

Course with Code: Basic Human Rights (BTHM306)	**Semester-III**
Teaching Scheme Theory: 02 hrs/week Audit Course	

Course Contents

Unit I: The Basic Concepts **(6hrs)**

Individual, Group, Civil Society, State, Equality, Justice, Human Values: - Humanity, Virtues, Compassion.

Unit II: Human Rights and Human Duties **(6hrs)**

Origin, Civil and Political Rights, Contribution of American Bill of Rights, French Revolution, Declaration of Independence, Rights of Citizen, Rights of working and Exploited people, Fundamental Rights and Economic program, India's Charter of freedom

Unit III: Society, Religion, Culture, and their Inter-Relationship **(6hrs)**

Impact of Social Structure on Human behaviour, Roll of Socialization in Human Values, Science and Technology, Modernization, Globalization, and Dehumanization.

Unit IV: Social Structure and Social Problems **(6hrs)**

Social and Communal Conflicts and Social Harmony, Rural Poverty, Unemployment, Bonded Labour, Migrant workers and Human Rights Violations, Human Rights of mentally and physically challenged.

Unit V: State, Individual Liberty, Freedom and Democracy **(6hrs)**

The changing of state with special reference to developing countries, Concept of development under Development and Social action, need for Collective action in developing societies and methods of social action, NGOs and Human Rights in India: - Land, Water, Forest issues.

Unit VI: Human Rights in Indian Constitution and Law **(6hrs)**

The constitution of India: Preamble, Fundamental Rights, Directive principles of state policy, Fundamental Duties, Some other provisions. Universal declaration of Human Rights and Provisions of India, Constitution and Law, National Human Rights Commission and State Human Rights Commission

Reference Books:

1. Shastry T. S. N., “India and Human rights: Reflections,” Concept Publishing Company India (P Ltd.), 2005.

2. Nirmal C.J., “Human Rights in India: Historical, Social and Political Perspectives (Law in India),” Oxford, India.

Course with Code: Electrical Machines-I Lab (BTECL307)
Perform any eight experiments from given list
1. To perform the polarity test on single phase transformer 2. To perform the OC and SC test on single phase transformer to calculate efficiency and regulation 3. To perform the following three phase transformer connections: Star-Star, Star-Delta, Delta-Delta, Delta -Star, Open Delta, Scott Connection 4. To perform the direct loading test on single phase transformer to calculate efficiency and regulation 5. To perform the indirect loading test on 3-phase transformer to calculate efficiency 6. To perform the parallel operation of two single phase transformers. 7. To study DC Machine 8. To draw the speed characteristics of DC shunt motor by- Armature Control method and Field Control method 9. To perform the load test on DC Shunt motor. 10. To study the load characteristics of Cumulative compound generator and Differential compound Generator 11. To study the magnetization, internal and External characteristics of a DC generator. 12. To Study Starters for DC Shunt Motor.

Course with Code: Electrical and Electronics Measurement Lab (BTECL308)
Perform any eight experiments from given list
1. Study of Cathode Ray Oscilloscope. 2. Measurement of Frequency & Phase by Using Lissajous Pattern method. 3. Measurement of Power in single phase circuit by Wattmeter method. 4. Measurement of Energy in single phase circuit. 5. Measurement of Insulation Resistance of Cable by using MEGGER. 6. Measurement of Resistance by using Wheatstone Bridge. 7. Measurement of inductance by using Maxwell's Bridge. 8. Measurement of capacitance by using Schering Bridge. 9. Study of LVDT for Measurement of Displacement. 10. Study the characteristics of RTD Pt100 and study of it for measurement of the temperature. 11. Study the characteristics of Thermistor and Study of it for Measurement of temperature. 12. Study the characteristics of Thermocouple. 13. Study the characteristics of LDR.

Course with Code: Data Structure using CPP Lab (BTECL309)
Perform following experiments.
1. Programs on class and array of objects.
2. Programs on Inheritance and Polymorphism.
3. Programs on Dynamic Memory Management.
4. Programs on function overloading, pointer to object.
5. Write a program to implement stack using arrays (with all operations).
6. Write a program to implement queue using arrays (with all operations).
7. Write a program to implement linear search.
8. Write a program to implement binary search.
9. Write a program to implement Insertion sort, Merge sort, Quick sort.
10. Write a program to implement Bubble sort, Selection sort.
11. Write a program to perform operations on singly linked list.
12. Write a program to evaluate a given postfix expression using stacks.
13. Write a program to convert a given infix expression to postfix form using stacks.

Course with Code: Internship-I Evaluation (BTES211P)
It should be evaluated based on report and completion certificate by the concerned industry/organisation.

Course with Code: Network Theory (BTECC401)	**Semester-IV**
Teaching Scheme Theory: 03 hrs/week Tutorial: 01 hr/week Credits: 04	**Examination Scheme** Mid Semester Exam: 20 Marks Internal Assessment: 20 Marks End Semester Exam: 60 Marks

Course Contents

Unit I: Circuit Elements **(7 hours)**

Types of sources: dependent & independent, R, L, C, Self & mutual inductance, Source transformation, Introduction of star-delta connection & it's interconversion. Classification of circuit elements: Lumped & distributed, Linear & non-linear, Unilateral & bilateral, Time variant & invariant,

Unit II: Network Theorems **(12 hours)**

KVL, KCL, Nodal analysis, Mesh analysis, Thevenin's, Norton's Reciprocity, Super position, Maximum power transfer, Substitution, Tellegen's theorem for AC & DC circuits. Graph Theory: Network topology, concept of graph, tree, node, super node, mesh & super mesh, branch, chords, incidence, cut & tie set matrix using network topology, concept of duality & dual network.

Unit III: Transient Analysis **(10 hours)**

Initial & final condition of network & it's evaluation, solution of first & second order differential equations of series & parallel R-L, R-C. R-L-C circuits, General & particular solutions, time constant, Mathematical analysis of circuit transients, Steady State A. C. Circuit: R-L-C series circuits, Series resonance, Variation of Z with frequency, Magnification, Bandwidth, Q factor. Parallel Resonance: Resonance frequency for tank circuit frequency. Locus diagram of series R-L., R-C with variable R & X, Filter: Introduction classification, Low pass, High pass, Band pass & band reject filter, active & passive filters.

Unit IV: Application of Laplace Transform **(7 hours)**

Standard test input signal- unit step, impulse & ramp functions & their Laplace transformation, solution of differential equation using Laplace transform, solution of R-L, R-C, R-L-C circuit using Laplace transform, transient & steady state response of RL, RC circuit

using Laplace transform

Unit V: Two Port Network **(6 hours)**

Terminals& terminal pairs, driving points & transfer admittance, Transfer functions, Concept of poles & zeroes, two port networks, Z. Y & the transmission parameters relationship between parameter sets.

Reference Books:

1. Mac. E. Van Valkenburg, “Network Analysis”.
2. C. K. Alexander, M. N. O. Sadiku, “Electrical Circuits,” 2nd Edition Tata McGraw-Hill.
3. Franklin Fa-Kun. Kuo, “Network Analysis & Synthesis”, John Wiley & Sons.
4. M. L. Soni, J. C. Gupta, “A Course in Electrical Circuits and Analysis”.
5. Mac. E. Van Valkenburg, “Network Synthesis”.
6. Joseph A. Edminister, Mahmood Maqvi, “Theory and Problems of Electric Circuits,” Schaum's Outline Series.

Course with Code: Power System-I (BTECC402)	**Semester-IV**
Teaching Scheme Theory: 03 hrs/week Credits: 03	**Examination Scheme** Mid Semester Exam: 20 Marks Internal Assessment: 20 Marks End Semester Exam: 60 Marks

Course Contents

Unit I: Electrical Power Generation **(9 hours)**

Evolution of Power Systems, Typical Layout of an Electrical Power System - Introduction to different sources of energy. Construction and working of thermal power plants, Hydro power station, Nuclear Power Plant, Solar power plant with neat block diagram of main parts. Descriptive treatment of alternator exciter & excitation systems, major electrical equipment in generating stations.

Unit II: Mechanical Design of Transmission Lines **(8 hours)**

Types of conductors, Choice of conductor materials, Stranded copper & ACSR conductor, Insulation consideration, Different types of insulators, supports, distribution of voltage across the insulator string, String efficiency, Effect of wind & ice coating on transmission line, sag due to equal & unequa1 supports, with their derivation, numerical.

Unit III: Electrical Design of Overhead Transmission Lines **(9 hours)**

Line conductors, inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, concept of GMD and GMR, Composite conductors-transposition, bundled conductors, and effect of earth on capacitance. Skin effect, proximity effect, Ferranti Effect. Corona: Introduction, Factors affecting corona loss and methods of reducing corona loss, Disadvantages of corona.

Unit IV: Performance of Transmission Lines **(8 hours)**

Classification of overhead transmission lines, important terms, performance of 1-phase short transmission lines, three phase short transmission lines, effect of load power factor on regulation and efficiency, different types of medium transmission line, Analysis of long transmission lines, generalized constant of transmission line, determination of generalized constant of transmission lines, percentage regulation, Transmission efficiency, numerical.

Unit V: AC & DC Distribution **(8 hours)**

Classification of Distribution system, Requirement of distribution system, design consideration in distribution system. AC Distribution. Calculations, method of Solving AC Distribution problem, three phase unbalanced load, four wire unbalanced star connected load, ground detector. DC Distribution: types, DC distribution calculation, three wire DC system.

Text/Reference Books:

1. V K Mehta & Rohit Mehta, “Principles of Power System,” S. Chand Publications.
2. Gupta B. R., "Power Plant Engineering,” (Eurasia publications).
3. Nag P. K. “Power Plant Engineering,” (Tata McGraw Hill Publications).
4. Kothari Nagrath, “Electric Power System,” (Tata McGraw Hill Publications).
S. Wadhva S. L., “Electric Power System,” (Tata McGraw Hill Publications).
6. Stevenson W. B., “Power System,” (English Language Book Society publications).

Course with Code: Electrical Machines-II (BTECC403)	**Semester-IV**
Teaching Scheme Theory: 03 hrs/week Tutorial: 01 hr/week Credits: 04	**Examination Scheme** Mid Semester Exam: 20 Marks Internal Assessment: 20 Marks End Semester Exam: 60 Marks

Course Contents

Unit I: Basic Concepts of A.C Machines and armature windings (9 hours)

Classification of A.C. Machines, principle of operation and constructional features of 3-phase synchronous and 3-phase induction machines, rotating MMF waves in A.C Machines, 3-phase ac machine windings, winding factors, emf equation.

Unit II: Three Phase Synchronous Machines (10 hours)

Construction, types, armature reaction, circuit model of synchronous machine, determination of synchronous reactance, phasor diagram, power angle characteristics, voltage regulation of alternator, parallel operation of synchronous generators, synchronizing to infinite bus bars, synchronous motor operation, characteristic curves, synchronous condenser, dynamics.

Unit III: Three phase Induction Motor (9 hours)

Types of induction motor, flux and MMF waves, development of circuit model, power across air gap, torque and power output, OC and SC tests, circle diagram, starting methods, cogging and crawling, speed control, deep bar/ double cage rotor, high efficiency induction motors.

Unit IV: Fractional Kilowatt Motors (6 hours)

Introduction, single phase induction motors, double revolving field theory, circuit model of single-phase induction motor, determination of circuit parameters.

Unit V: Special Machines (6 hours)

Single phase synchronous motors, permanent magnet ac motors, ac servomotors, linear induction motor.

Text Books:

1. J B Gupta, "Theory and Performance of Electrical Machines," S. K. Kataria & Sons, New Delhi.

2. P. S. Bimbhra, "Electrical Machinery," Khanna Publishers.
3. B. L. Theraja, A. K. Theraja, "A text book of Electrical Technology," S. C hand Publishers.
4. Asfaq Hussein, "Electric Machines," Danpat Rai Publisher.
5. V. K. Mehata, Rohit Mehata, "Principles of Electrical machines," S. Chand Publishers.

Reference Books:

1. Say M. G., "Design & performance of A C. Machines," (Book Publications, 3rd edition).
2. Bimbhra P. S., "Electric Machines," (South Ex Publications, New Delhi).
3. D P Kothari, I. J. Nagrath, "Electric Machines," Tata McGraw Hill Publication, Fourth edition, reprint 2012.
4. A F. Puchstein, T C Lloyd, A G Conrad, "Alternating current machines," John Wiley and Sons, New York 1954.
5. A E. Fitzgerald, Charles Kingsley Jr., Stephen D. Umans, "Electric Machinery," Tata McGraw Hill Publication, sixth edition 2002.
6. Fitzaralda, "Electrical Machines," (Tata McGraw Hill Publications).

Course with Code: Computer Algorithm (BTECPE404A)	**Semester-IV**
Teaching Scheme Theory: 03 hrs/week Credits: 03	**Examination Scheme** Mid Semester Exam: 20 Marks Internal Assessment: 20 Marks End Semester Exam: 60 Marks

Course Contents

Unit I: Introduction to Algorithms **(6 hrs)**

Definition of Algorithms, Properties of Algorithms, Expressing Algorithm, Flowchart, Algorithm Design Techniques, Performance Analysis of Algorithms, Types of Algorithm's Analysis, Order of Growth, Asymptotic Notations, Recursion, Recurrences Relation, Substitution Method, Iterative Method, Recursion Tree, Master Theorem, Changing Variable, Heap Sort.

Unit II: Divide and Conquer **(6 hrs)**

Introduction to Divide and Conquer Technique, Binary Search, Merge Sort, Quick Sort, Strassen's Matrix Multiplication.

Unit III: Greedy Algorithms **(6 hrs)**

Introduction to Greedy Technique, Greedy Method, Optimal Merge Patterns, Huffman Coding, Knapsack Problem, Activity Selection Problem, Job Sequencing with Deadline, Minimum Spanning Tree, Single-Source Shortest Path Algorithm.

Unit IV: Backtracking **(6 hrs)**

Backtracking Concept, N–Queens Problem, Four–Queens Problem, Eight–Queen Problem, Hamiltonian Cycle, Sum of Subsets Problem, Graph Colouring Problem. Branch and Bound: Introduction, Traveling Salesperson Problem, 15-Puzzle Problem, Comparisons between Backtracking and Branch and Bound.

Unit V: Tree **(6 hrs)**

Introduction, B-tree, Red-Black Tree (RBT): Insertion, Deletion. NP Completeness: Introduction, The Complexity Class P, The Complexity Class NP, Polynomial Time Reduction, The Complexity Class NP-Complete.

Reference Books:

1. Aho, Ullman, Data Structure and Algorithms, Addison-Wesley Pub., 1st Edition, 1983.

2. Michel Goodrich, Roberto Tamassia, Algorithm Design – Foundation, Analysis & Internet Examples, Wiley Publication, 2nd Edition, 2006.

3. George T. Heineman, Gary Pollice, Stanley Selkow, Algorithms in a Nutshell, A Practical Guide, O'Reilly Media, 2nd Edition, 2016.

Text Books:

1. Cormen, Introduction to Algorithms, PHI Publication, 2nd Edition, 2002.

2. Ellise Horowitz, Sartaj Sahni, S. Rajasekaran, Fundamentals of Computer Algorithms, University Press (India) Private Ltd, 2nd Edition, 2008.

3. Sara Base, Computer algorithms: Introduction to Design and Analysis, Addison-Wesley Publication, 2nd Edition, 1988.

Course with Code: Competitive Programming (BTECPE404B)	**Semester-IV**
Teaching Scheme Theory: 03 hrs/week Credits: 03	**Examination Scheme** Mid Semester Exam: 20 Marks Internal Assessment: 20 Marks End Semester Exam: 60 Marks

Course Contents

Unit I: Introduction **(7 hrs)**

Online Judge: The Programming Challenges Robot Judge, Understanding Feedback from the Judge, Choosing Programming Languages, Reading Our Programs, Standard Input/Output, Programming Hints, Elementary Data Types. Challenging Problems (1) The 3n + 1 Problem (2) Minesweeper (3) The Trip, (4) LCD Display (5) Graphical Editor (6) Interpreter (7) Check the Check (8) Australian Voting.

Unit II: Sorting **(6 hrs)**

Sorting Applications Sorting Algorithms, Program Design Example: Rating the Field, Sorting Library Functions, Rating the Field, Challenging Problems (1) Vito's Family (2) Stacks of Flapjacks (3) Bridge (4) Longest Nap (5) Shoemaker's Problem (6) CDVII (7) Shell Sort (8) Football.

Unit III: Number Theory Prime Numbers **(5 hrs)**

Finding Primes, Counting Primes, Divisibility Greatest Common Divisor, Least Common Multiple, Modular Arithmetic, Congruence's Operations on Congruence's, Solving Linear Congruence's, Diophantine Equations, Number Theoretic Libraries.

Unit IV: Backtracking and Dynamic Programming **(7 hrs)**

Backtracking, Constructing All Subsets, Constructing All Permutations, Program Design Example: The Eight-Queens Problem, Pruning Search. Dynamic programming: Introduction, Characteristics of Dynamic Programming, Component of Dynamic Programming, Comparison of Divide-and-Conquer and Dynamic Programming Techniques, Challenging Problems (1) Little Bishops (2) 15-Puzzle Problem (3) Queue (4) Servicing Stations (5) Tug of War (6) Garden of Eden (7) Colour Hash (8) Bigger Square Please.

Unit V: Graph Traversal **(7 hrs)**

Flavors of Graphs, Data Structures for Graphs, Graph Traversal: Breadth-First, Breadth-First Search, Exploiting Traversal, And Finding Paths Graph Traversal: Depth-First Finding Cycles Connected Components Topological Sorting. Graph Theory, Degree Properties, and Connectivity, Cycles in Graphs, Planar Graphs, Minimum Spanning Trees, Shortest Paths, Dijkstra's Algorithm, All-Pairs Shortest Path, Network Flows.

Reference Books:

1. Steven S. Skiena Miguel A. Revilla, Programming Challenges: The Programming Contest Training Manual, Springer.

2. Antti Laaksonen, Competitive Programmer's Handbook.

3. Steven Halim, Competitive Programming 3: The Lower Bounds of Programming Contests.

4. Gayle Lakaman Cracking the Coding Interview.

5. The Hitchhiker's Guide to the Programming Contests.

Course with Code: Numerical Methods and Programming (BTECPE404C)	**Semester-IV**
Teaching Scheme Theory: 03 hrs/week Credits: 03	**Examination Scheme** Mid Semester Exam: 20 Marks Internal Assessment: 20 Marks End Semester Exam: 60 Marks

Course Contents

Unit I: Solution of Algebraic and Transcendental Equation **(7 hrs)**

Solution of Algebraic and Transcendental Equation: Bisection method, Method of false position, Newton's method and Newton-Raphson method.

Unit II: Solution of Linear Simultaneous Equation **(7 hrs)**

Solution of Linear Simultaneous Equation: Gauss elimination method, Gauss-Jordan method, Iterative method of solution- Jacobi iteration method, Gauss-Seidel iteration method, Relaxation method.

Unit III: Finite Differences **(7 hrs)**

Finite Differences: Forward difference operator, Backward difference operator, Central difference operator, Newton's interpolation formulae, Newton's forward–backward-central interpolation formulae.

Unit IV: Differentiation and Integration **(7 hrs)**

Differentiation and Integration: Newton-Cortes formula, Trapezoidal rule, Simpson one–third rule, Simpson three- eighth rule.

Unit V: Numerical Solution of ODE **(7 hrs)**

Numerical Solution of ODE: Picard's methods, Taylor series method, Euler's method, Modified Euler's method, Runge-Kutta method.

Text/Reference Books:

1. B. S. Grewal, Higher Engineering Mathematics, 40th edition, Khanna publication Reference Books: 1. S. S. Shastri, Introduction to Numerical Methods, PHI publication.

2. V. Rajaraman, Computer Oriented Methods, 3rd edition, PHI publication.

3. Conte and De boor, Elementary Numerical Analysis, BPB publication.

4. E. Kreyszig, Advanced Engineering Mathematics, BPB publication.

5. Steven C Chapra, Numerical Methods for Engineers, 5th edition, McGraw Hill publication.

(NPTEL Course: Numerical Methods, Prof. Ameeya Kumar Nayak and Prof. Sanjeev Kumar, IIT Roorkee)

Course with Code: Computer Architecture and Operating System (BTECC405)	**Semester-IV**
Teaching Scheme Theory: 03 hrs/week Credits: 03	**Examination Scheme** Mid Semester Exam: 20 Marks Internal Assessment: 20 Marks End Semester Exam: 60 Marks

Course Contents

Unit I: Introduction, Arithmetic and Instruction Sets (07 hours)

Introduction: Concept of computer organization and architecture, Fundamental unit, Computer function and interconnection, CPU structure and function. Computer Arithmetic: The arithmetic and logic Unit, Integer representation, Floating point representation, Introduction of arithmetic co-processor. Instruction Sets: Characteristics, Types of operands, Types of operations, Assembly language, Addressing modes, Instruction format, Types of instruction, Instruction execution, Machine state and processor status, Structure of program, Introduction to RISC and CISC architecture.

Unit II: Control Unit & Input/ Output Organization (08 hours)

Control Unit: Control unit operation: Micro-operations, Control of the processor, Hardwired implementation, Micro-programmed Control Unit, Basic concepts, Micro-instruction sequencing, Micro-instruction execution, Applications of micro-programming. Input/ Output Organization: External devices, I/O module, Programmed I/O, Interrupt driven I/ O, Direct memory access, I/O channels and processors, External interface. Instruction pipe-lining: Concepts. Parallel processing: Multiple processor organization, Symmetric multiprocessor. Memory Organization: Internal Memory: Semiconductor main memory, Advanced DRAM organization, Virtual memory systems and cache memory systems. External Memory: Organization and characteristics of magnetic disk, Magnetic tape, Optical memory, RAID, Memory controllers.

Unit III: Introduction OS & Processes and CPU Scheduling (07 hours)

Introduction and Operating system structures: Definition, Types of Operating system, Real Time operating system, System Components- System Services, Systems Calls, System Programs, System structure. Virtual Machines, Processes and CPU Scheduling: Process

Concept, Process Scheduling, Operation on process, Cooperating processes. Threads, Inter-process Communication, Scheduling criteria, scheduling Algorithms, Multiple-Processor Scheduling, , Scheduling Algorithms and performance evaluation.

Unit IV: Process Synchronization & Deadlocks (07 hours)

Process Synchronization: The critical-section problem, Critical regions, Synchronization Hardware, Semaphores, Classical Problems of synchronization. Deadlocks: Systems Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined approach to deadlock Handling.

Unit V: Memory Management (08 hours)

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Continuous Memory Allocation, Fixed and variable partition, Internal and external fragmentation and compaction, Paging: Principle of operation, Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging. Virtual Memory: Basics of Virtual Memory —Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

Text Books:

1. William Stalling, Computer Organization and Architecture: Designing for Performance, Prentice Hall Publication, 8th Edition, 2009.
2. Hayes, Computer Architecture and Organization, McGraw-Hill Publication, 3rd Ed., 2012.
3. Zaky, Computer Organization, McGraw-Hill Publication, 5th Edition, 2011.
4. Andrew S. Tanenbaum, Modern Operating System, PHI Publication, 4th Edition, 2015.

Reference Books:

1. Hennessy and Patterson, Computer Architecture: A Quantitative Approach, Morgan and Kaufman Publication, 4th Edition, 2007.
2. Morris Mano, Computer System Architecture, Pearson Education India, 3rd Edition, 2007.
3. Mostafa Abd-El-Barr, Hesham El-Rewini, Fundamentals of Computer Organization and Architecture, Wiley Publication, 1st Edition, 2004.

Course with Code: Electrical Machines-II Lab (BTECL406)
Perform any eight experiments from given list.
1. Study of different starters of 3-phase induction motors. 2. Load test of 3-phase squirrel cage induction motor by direct loading method. 3. Load test of 3-phase squirrel cage induction motor by indirect loading method. 4. Load test of 3-phase slip ring induction motor by direct loading method. 5. Load test of 3-phase slip ring induction motor by indirect loading method. 6. Voltage regulation of 3-phase alternator by synchronous impedance method. 7. To draw V and inverted V curve of 3-phase synchronous motor. 8. No load and blocked rotor test of 3-phase induction motor to find equivalent circuit parameters. 9. No load and blocked rotor test of 3-phase induction motor to draw circle diagram. 10. Speed control of slip ring induction motor by rotor resistance control method.

Course with Code:

Python Programming Lab (BTECL407)

Teaching Scheme

Theory: 01 hrs/week

Lab: 02 hrs/week

Credits: 02

Course Contents

(One hour per week is for program demonstration and instruction which can be conducted as a classroom session or lab session.)

*Programming assignments are mandatory.

Unit I: Introduction to python programming (2 hours)

Informal introduction to programming, algorithms and data structures, downloading and installing Python, run a simple program on Python interpreter.

Unit II: Variables, operations, control flow in Python (2 hours)

Variables, operations, control flow – assignments, conditionals, loops, functions: optional arguments, default values, passing functions as arguments.

Unit III: Statements, Expressions, Strings in Python (2 hours)

Statements, Expressions, Strings: String processing. Exception handling, Basic input/output, handling files.

Unit IV: Class and Object, Data Structure in Python (2 hours)

Class and Object, Data Structure: List, Tuple and Sequences, Set, Dictionaries.

Unit V: Using Database and Structured Query Languages (SQL) (4 hours)

Using Database and Structured Query Languages (SQL): SQLite manager, Spidering Twitter using a Database, Programming with multiple tables, JOIN to retrieve data.

Text Book:

1. Michael Urban and Joel Murach, Murach's Python Programming, Murach's Pub., 2016.

Reference Books:

1. Charles Severance, Python for Informatics: Exploring Information, University of

Michigan, Version 2.7.0, 2014.

2. Dr. R. Nageswara Rao, Core Python Programming, Dreamtech Press, 1st Edition, 2016.

3. Mark Lutz, Learning Python, O'Reilly Media, 5th Edition, 2013.

4. Mark Pilgrim, Dive into Python 3, A press Publication, 2nd Edition, 2009.

5. Allen B. Downey, Think Python, O'Reilly Media, 2nd Edition, 2012.

6. Jon Kleinberg and Eva Tardos, Algorithm Design, Pearson Education, 1st Edition, 2006.

List of Experiments:

1. Program to calculate area of triangle, rectangle, circle

2. Program to find the union of two lists.

3. Program to find the intersection of two lists.

4. Program to remove the —i‖ th occurrence of the given word in a list where words repeat.

5. Program to count the occurrences of each word in a given string sentence.

6. Program to check if a substring is present in a given string.

7. Program to map two lists into a dictionary.

8. Program to count the frequency of words appearing in a string using a dictionary.

9. Program to create a dictionary with key as first character and value as words starting with that character.

10. Program to find the length of a list using recursion.

11. Compute the diameter, circumference, and volume of a sphere using class

12. Program to read a file and capitalize the first letter of every word in the file.

Course with Code: Power System-I Lab (BTECL408)
Perform any eight experiments from given list.
1. To study the layout of Thermal Power Plant with its components 2. To study the Solar Power Plant with its components 3. To study the various Alternator excitation systems 4. To study the types and properties of various overhead conductors 5. To study the types and properties of various overhead Insulator 6. To study the different types of Power cables. 7. To study the layout of o substation along with its components 8. To determine the ABCD parameters of a medium and long transmission line. 9. To Visit a substation and write a technical report on the observations.