R.T.M. Nagpur University, Nagpur
Four Year B.Tech. Course
(Revised Curriculum as per AICTE Model Curriculum)

B.Tech. III Semester (Computer Technology) Scheme

Subject Code	Subject	Teaching Scheme			Evaluation Scheme			Credits	Category	Minimum Passing	
		L	T	P	CA	UE	Total			Theory	Practical
BTCT301T	Mathematics III (TH)	3	1	0	30	70	100	4	BSC	45	
BTCT302T	Problem Solving using Python (TH)	3	0	0	30	70	100	3	PCC	45	
BTCT302P	Problem solving using Python (PR)	0	0	2	25	25	50	1	PCC		25
BTCT303T	Digital Design and Fundamentals of Microprocessor (TH)	3	0	0	30	70	100	3	PCC	45	
BTCT303P	Digital Design and Fundamentals of Microprocessor (PR)	0	0	2	25	25	50	1	PCC		25
BTCT304T	Computer Architecture and Organization (TH)	3	1	0	30	70	100	4	PCC	45	
BTCT305T	Theoretical Foundations of Computer Science	3	1	0	30	70	100	4	PCC	45	
BTCT306T	Universal Human Values (TH)	2	0	0	15	35	50	2	HSMC	23	
BTCT307P	Computer Workshop-I (Web Technologies) (PR)	0	0	2	25	25	50	1	PCC		25
BTCT308T	Consumer Affairs (Audit)	2	0	0	0	0	0	0	MC		
	Total	19	3	06	240	460	700	23			

PCC-Professional Core Courses **ESC**-Engineering Science Courses **LC**-Laboratory Course
OEC-Open Elective Courses **MC**- Mandatory Course **PROJ**-Project
BSC-Basic Science Courses **PEC**-Professional Elective Courses
HSMC- Humanities and Social Sciences including Management Courses

(Ashesh Sharma) Dr Lalit Malik Dr N.M. Thakare Dr R.N. Jogekar

Mathematics-III (TH)	
Total Credits: 04	Subject Code : BECT301T
Teaching Scheme :	Examination Scheme :
Lectures: 3 Hours/Week	Duration of University Exam :03 Hrs.
Tutorials: 1 Hours/Week	College Assessment: 30 Marks
Practical: 0 Hours/Week	University Assesment:70 Marks

Course Objectives:

1. A primary objective is to provide a bridge for the student from lower-division mathematics courses to upper-divisionmathematics.
2. Explain the importance of mathematics and its techniques to solve real life problems and provide the limitations of such techniques and the validity of theresults.
3. Propose new mathematical and statistical questions and suggest possible software packages and/or computer programming to find solutions to thesequestions.

Course Outcomes:

After completing the course, students will be able to

1. Understand the basics of Laplace, Fourier and Z transforms and apply them for solving differential equations, integral equations and differenceequations.
2. Analyze real world scenarios to recognize when matrices and probability are appropriate, formulate problems about the scenarios, creatively model these scenarios (using technology, if appropriate) in order to solve the problems using multipleapproaches.
3. Organize, manage and present data in a clear and concise manner.
4. Develop an ability to identify, formulate, and/or solve real worldproblems.
5. Understand the impact of scientific and engineering solutions in a global and societalcontext.
6. Create the groundwork for post-graduate courses, specialized study, and research in computationalmathematics.

Unit I:IntegralTransforms(10Hrs)

Laplace Transform: Definition, Properties of Laplace transform (Statement only), Evaluation of integrals by Laplace transform, Inverse Laplace transform by partial fraction method, Convolution theorem (Statement only), Simple applications of Laplace transform to solve ordinary differential equations.

Fourier Transform: Definition and Properties (excluding FFT), Applications of Fourier transform to solve integral equations.

UnitII:Z-Transform(10Hrs)

Definition and convergence of Z-transform, Properties (Statement only) and examples, Inverse Z-transform by partial fraction method, Convolution of two sequences, Power series method, Solution of difference equations with constant coefficients by Z-transformmethod.

UnitIII:Matrices(08Hrs)

Linear dependence of vectors, Eigen values and Eigen vectors, Reduction to diagonal form, Singular value decomposition, Sylvester's theorem (Statement only), Largest Eigen value and its corresponding Eigen vector by iteration method.

Unit IV: Mathematical Expectation andProbabilityDistributions (10 Hrs)

Review of discrete and continuous random variables, Mathematical expectation, Variance, Standard deviation, Moments, Moment generating function, Binomial distribution, Poisson's distribution, Normal distribution, Exponentialdistribution.

Unit V:StatisticalTechniques (10 Hrs)

Statistics: Introduction to correlation and regression, Multiple correlation and its properties, Multiple regression analysis, Regression equation of three variables.

Measures of central tendency: Mean, Median, Quartile, Decile, Percentile, Mode, Mean deviation, Standard deviation.

Skewness: Test and uses of skewness and types of distributions, Measure of skewness, Karl Pearson's coefficient of skewness, Measure of skewness based on moments.

Text/ Reference Books:

(1) Advanced Engineering Mathematics (Wiley), Erwin Kreyzig.
(2) Higher Engineering Mathematics (Khanna Publishers), B. S.Grewal.
(3) Advanced Engineering Mathematics (S. Chand), H. K.Dass.
(4) Probability and Statistics (Schaum's Outline Series), Murray Spiegel, John Schiller, R. A. Srinivasan.
(5) Advanced Mathematics for Engineers, ChandrikaPrasad.
(6) A text book of Engineering Mathematics (Laxmi Publication), N. P. Bali & M.Goyal.

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Problem Solving using Python (TH)	
Total Credits: 03	Subject Code : BECT302T
Teaching Scheme :	Examination Scheme :
Lectures: 3 Hours/Week	Duration of University Exam : 03 Hrs.
Tutorials: 0 Hours/Week	College Assessment: 30 Marks
Practical: 02 Hours/Week	University Assessment:70 Marks

Course Objectives :

1. To explain the basic concept of python ,object oriented programming and illustrate coding in Python Programming Language.
2. To make students capable of Implementing programs and applications using various features of python programming

Course Outcomes :

After completing the course, students will be able to

On successful completion of this subject the student will be able to:

1. Understand and implement the basic concept of python programming language.
2. Develop Code and test conditional statement of moderate size using the python language.
3. Implement the concept of Function and modules in programming language
4. Understand and Implement the concept of object oriented programming in python programming language.
5. Know and demonstrate the working of files for good program design using python language.

UNIT I : (08 Hours)

Introduction to Python, Domains, Python Basics: Identifiers and Keywords, Comments,Indentation and Multi-lining Python Types, Operations and Conversions, Python Format, Python Operators. Variables and Data Types, String Manipulation : Accessing Strings, Basic Operations, String slices, Lists : Introduction, Accessing list, Operations, Working with lists, Tuple: Introduction, Accessing tuples, Operations,Sets and Dictionaries. Console Input/Output, Formatted Printing.

UNIT II : (07 Hours)

Operator Conditional Statements : If, If- else, Nested if-else, Using NOT, AND, IN,Operator with If Else .Looping : For Loop Syntax,For Loop Workflow, Examples of For,Loop,Range() Function with for loop,Else Clause with For Loop, While Syntax, Examples,Nested loops, Control Statements,Break, Continue ,Pass.

UNIT III : (07 Hours)

Functions : Built-in,Functions, Library Functions, Defining a function ,Calling a function, Types of functions, Function,Arguments, Mutable Arguments and Binding of Default Values, Global and local,Variables Modules: Importing module, Math module, Random,module, Packages.

UNIT IV : (08 Hours)

Introduction to Object Oriented Programming (OOP), Features of OOP, Python Class and Objects ,Python Scopes and Namespaces, Classes and methods.

UNIT V : (06 Hours)
Working with Files: File InputOutput,Read and Write Operations, Set File offset in Python, Python File object methods, Renaming and deleting files in Python.

Text Books :

1. **Let Us Python- 2nd Revised & Updated Edition By Yashavant Kanetkar ,Aditya Kanetkar , ISBN: 9789389845006, Edition: 2020/ 2nd**
2. **Core Python Programming Kindle Edition by Dr. R. Nageswara Rao**

Problem Solving using Python (P)	
Total Credits: 01	Subject code : BECT302P
Lectures: 0 Hours/Week	Examination Scheme:
Tutorials: 0 Hours/Week	College Assessment: 25 Marks
Practical: 2 Hours/Week	University Assesment:25 Marks

Practicals will be based on the concepts taught in Theory. Minimum 10 experiments to be implemented using python programming .

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Digital Design and Fundaments of Microprocessor (TH)	
Total Credits: 03	Subject Code : BECT303T
Teaching Scheme :	Examination Scheme:
Lectures: 3 Hours/Week	Duration of University Exam : 03 Hrs.
Tutorials: 0 Hours/Week	College Assessment: 30 Marks
Practical: 0 Hours/Week	University Assesment:70 Marks

Course Objectives :

1. To explain basic elements of the digital systems such as number systems, combinational and sequential circuits.
2. To describe design methods of the combinational and sequential circuits.
3. To explain architectural components of a microprocessor 8085, its assembly language and basic elements of assembly language programming in 8085.

Course Outcomes :
After completing the course, students will be able to

1. Describe and compare various number systems, interconversion of number systems, obtain and uptimes Boolean equations for variety of problems.
2. Describe, design various combinational circuits such as Code Converters, Comparators, Multiplexers, Demultiplexer, Encoder, Decoder, Adders, etc. and analyses their performance.
3. Describe, design various sequential circuits such as Latches, Flip flops, counters, registers, and analyses their performance
4. To explain architectural components of a microprocessor 8085, issues involved memory related operations, intricacies of execution of various instructions.
5. To explain various 8085 instructions, addressing modes, interrupt mechanism and their application to develop 8085 programs.

Unit I: (07 Hrs)
Number System : positional numbers systems such as decimaL, binary, hexadecimal, octal. Number system conversions, Binary coded decimal, weighted binary code, self-complementing codes, signed-magnitude binary codes, 1's and 2's complement, binary arithmetic. **Boolean Algebra:** Logic functions, identity rules and properties of Boolean variables, De Morgan's Theorem, SOP & POS forms, interconversion of forms, Minimization of Boolean equations using Karnaugh maps(up to five variables).

Unit II: (07 Hrs)
Combinational logic Design: Design procedure of combinational circuits, Code Converters, Comparators, Multiplexers, Demultiplexer, Encoder, Decoder, Adders, Subtractor (Half, Full), BCD Adder/ Subtractor, ripple and carry look-ahead addition.

Unit III (07 Hrs)
Sequential Logic Design: Latches, Flip flop – S-R,JK, D, T and Master-Slave JK FF, Conversion of one FF to another FF, synchronous counters , registers, Shift registers, ring counters

Unit IV (07 Hrs)
Introduction to Intel's 8085: Architecture Description, Flag structure, concept of PSW, Instruction cycle, instruction execution and sequencing, timing diagram for memory read/write and I/O operations.

Unit V (08 Hrs)
Instruction Set : data transfer instruction, arithmetic instruction, logical instruction flow control instructions, subroutines, Addressing Modes, programming techniques, Looping, Counting, Indexing, Counters & timing delays,
Intrupts: Interrupt concept & structure in 8085.Interrupt Service routines, RIM, SIM, DI, EI instructions, Simple Programs.

Text Books :

1. A.Anand Kumar, Fundamentals of digital circuits, Prentice-Hall of India Publication.
2. R.P.Jain, Modern digital Electronics, Tata McGraw Hill Publication..
3. R. S. Gaonkar, Microprocessors Architecture Programming and Application with 8085, Penram International Publication.

Reference Books:

1. Albart Malvino ,Digital Electronic Principles, McGraw Hill Education Publication.
2. D. V. Hall .Microprocessor and Interfacing, McGraw Hill Education Publication.

Digital Design and Fundaments of Microprocessor (P)	
Total Credits: 01	Subject Code : BECT303P
Lectures: 0 Hours/Week	Examination Scheme:
Tutorials: 0 Hours/Week	College Assessment: 25 Marks
Practical: 2 Hours/Week	University Assesment:25 Marks

Five Practical should be conducted on combinational and sequential circuits using hardware kits or software.
Five practical should be conducted on 8085 microprocessor using hardware kits or simulation software.

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Computer Architecture & Organization	
Total Credits: 04	Subject Code : BECT304T
Teaching Scheme :	Examination Scheme:
Lectures: 3 Hours/Week	Duration of University Exam : 03 Hrs.
Tutorials: 1 Hours/Week	College Assessment: 30 Marks
Practical: 0 Hours/Week	University Assesment:70 Marks

Course Objective:

Understand the basic concepts of computer architecture and organization, and the key skills of constructing cost-effective computer systems. *Learn* how to quantitatively evaluate different designs and organizations, and provide quantitative arguments in evaluating different designs.

Course Outcome:
After completing the course, students will be able to

1. Explain and illustrate basic functional units ,operational concepts of a computer system and apply assembly language programming
2. *I*llustrate various instruction formats and interpret execution of complete instruction in the processing unit , control unit and sequencing.
3. Analyze and apply logic circuits for implementing arithmetic operation.
4. Compare and analyze various memory system including semiconductors, ROM, RAM, Cache and virtual memory
5. Explain computer peripherals ,classify advance processor and Processors Families system

UNIT-I (10 Hrs)

Basic Structure of Computer System: Functional Units, Basic Operational Concepts, Bus Structures, Software, Multiprocessors and Multicomputer. **Machine Instruction & Programs**: Memory Locations, Addresses and Encoding of Information, Main Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Stacks, Subroutines

UNIT-II (10 Hrs)

Instruction Formats, Limitations of Short word- length machines, High Level Language considerations, IBM -370, **The Processing Unit**: Fundamental Concepts, Execution of a complete Instruction, Multiple Bus Organization, Hardwired Control, Microprogrammed Control unit, Sequencing of Control Signals, Pipelining Concepts and Performance.

UNIT-III (8 Hrs)

Arithmetic: Number Representation, Addition and Subtraction Signed Numbers, Design Fast Adders, Multiplication of positive number, Signed Operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations.

UNIT-IV (10Hrs)

The Main Memory: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Memory Hierarchy, Cache Memories, Performance Memory Interleaving, Virtual Memory, Memory management Requirement, Secondary Storage, I/O mapped I/O and memory mapped I/O

UNIT-V (10 Hrs)

Computer peripherals: I/O Devices, Online Storage, File Services **INPUT/OUTPUT ORGANIZATION**: Interrupts and Interrupts handling mechanisms, vectored interrupts, Synchronous vs. Asynchronous data transfer, Direct Memory Access, Parallel and serial port, SCSI & USB Bus **Processors Families**: Introduction to RISC and CISC Processors, Array Processors, loosely coupled, tightly coupled Systems. Vector Processing

BOOKS:

1. "Computer Organization", Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Indian Edition 5th, 2002.
2. "Computer Architecture and Organization", John P. Hayes, 3rd Edition, McGraw Hill.
3. "Computer Organization , Design and Architecture", Sajjan G. Shiva, 4th Edition, CRC Press

REFERENCES BOOKS:

1. "Computer System and Architecture", M Mano, PHI, 1993.
2. "Computer Organization & Architecture", W. Stallings,PHI, 2001.

Theoretical Foundations of Computer Science (TH)	
Total Credits: 04	Subject Code :BECT305T
Teaching Scheme :	Examination Scheme :
Lectures: 3 Hours/Week	Duration of University Exam : 03 Hrs.
Tutorials: 1 Hours/Week	College Assessment: 30 Marks
Practical: 0 Hours/Week	University Assesment:70 Marks

Course Objectives:

1. Provide students an understanding of basic concepts in Theory of Computation.
2. Teach formal languages and various models of computation.
3. Exhibit fundamental concepts related with Computability Theory.

Course Outcomes:

After successful completion of the course, the students will be able to:

1. Classify and design finite automata without output and with output to recognize regular languages.
2. Compare and contrast regular grammar and context free grammar.
3. Understand and design push down automata to recognize context free languages.
4. Discriminate linear bounded automata and turing machine and design it to recognize unrestricted languages.
5. Understand the basic concepts of Computability, Decidability, Solvability, Post Correspondence Problem and Ackerman Problem of Turing Machine.

UNIT-I (09 Hrs)

Strings, Alphabet, Language operations, Finite state machine definitions, Finite automation model,Acceptance of strings and language, Non deterministic finite automation, Deterministic finite automation, Equivalence between NFA and DFA, Conversion of NFA into DFA, Minimization of FSM, Equivalence between two FSM's

UNIT-II (10 Hrs)

Regular sets, Regular expressions, Identity rules, Manipulation rules, Manipulation of regular expressions, Equivalence between RE and FA, Inter conversion, Pumping lemma, Closure properties of regular sets(proofs not required), Chomsky hierarchy of languages, Regular grammars, Right linear and left linear grammars, Equivalence between regular and FA, Inter conversion between RE and RG

UNIT-III (10 Hrs)

Context free grammar, Derivation trees, Chomsky normal form, Greibach normal form, Push down automata, Definition, Model acceptance of CFL, , Closure properties of CFL(Proofs omitted),Pumping Lemma of CFL, Introduction of DCFL and DPDA

UNIT-IV (10 Hrs)

Turing Machine: Definition, Model of TM, Design of TM, Universal Turing Machine, Computable function, Recursive enumerable language, Types of TM's (proofs not required), Linear bounded automata and Context sensitive language, Counter machine.

UNIT-V (09 Hrs)
Decidability and Undecidability of problems,Properties of recursive & recursively enumerable languages, Halting problems, Post correspondence problem, Ackerman function, and Church's hypothesis. Bounded Minimalization, Unbounded Minimalization.

Text Books:

1. J.E.Hopcraft,R. Motwani, J. D Ullman, Introduction to Automata Theory, Languages and Computation , Pearson Education, Aisa Publication.
2. Peter Linz, An Introduction to Formal Languages and Automata, Jones and Bartlett Learning Publications.
3. John Martin, Introduction to Languages and the theory of Automata, Tata McGraw Hill Publication..

Reference Books:

1. K. L. P. Mishra and N. Chandrasekaran, Theory of Computer Science, Automata, Languages and Computation, PHI Learning.
2. Lewis H.P and Papadimition C.H, Elements of Theory of Computation, **Pearson** Publication.

Universal Human Values (TH)	
Total Credits: 02	Subject Code: BECT306T
Teaching Scheme :	Examination Scheme
Lectures: 2 Hours/Week	Duration of University Exam : 1.5 Hrs.
Tutorials: 0 Hours/Week	College Assessment: 15 Marks
Practical: 0 Hours/Week	University Assesment: 35 Marks

Objective:

Theobjectiveofthecourseisfourfold:

1. Development of a holistic perspective based on self-exploration, about themselves (human being),family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengtheningofself-reflection.
4. Developmentofcommitmentandcouragetoact.

Course outcomes:

By the end of the course,

1. Students are expected to become more aware ofthemselves, and their surroundings (family, society, nature)
2. Students would becomemore responsible in life, and in handling problems with sustainable solutions,whilekeepinghumanrelationshipsandhumannature inmind.
3. They would have better critical ability.
4. They would also become sensitive to theircommitment towards what they have understood (human values, humanrelationshipandhumansociety).

Unit I (06 Hrs)

Value education, definition, need for value education. The content and the process of value education, basic guidelines for value education, self-exploration as a means of value education, happiness and prosperity as part of value education.

Unit II (06 Hrs)

Harmony of self with body, coexistence of self and body, understanding the needs of self and the needs of body, understanding the activities in the self and the activities in the body.

Unit III (06 Hrs)

Values in relationship, the five dimensions of human endeavour, the holistic perception of harmony in existence.

Unit IV (06 Hrs)

Basics for ethical human conduct, defects in ethical human conduct, human rights violations and social disparities, value based life.

Reference Books

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria,ExcelBooks, NewDelhi,2010
2. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.
3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4. Indian Ethos and Modern Management: Amalgam of the best of the ideas from the Eastand the West, B.L. Bajpai, New Royal Book Bo., Lucknow, 2004
5. Human society in ethics and politics, Bertrand Russel, Routledge Publications, 2009

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Computer Workshop-I (**Web Technlogies (P)**)	
Total Credits: 01	Subject Code : BECT307P
Teaching Scheme :	Examination Scheme:
Lectures: 0 Hours/Week	Duration of University Exam : 03 Hrs.
Tutorials: 0 Hours/Week	College Assessment: 25 Marks
Practical: 2 Hours/Week	University Assesment:25 Marks

Minimum 10 experiments to be performed base on following topics

- HTML
- CSS
- JavaScript
- Development of simple web based application.

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Consumer Affairs (TH)	
Total Credits: 02	Subject Code:BECT308T
Teaching Scheme :	Examination Scheme:
Lectures: 2 Hours/Week	Internal assessment
Tutorials: 0 Hours/Week	
Practical: 0 Hours/Week	

Course outcomes:

By the end of the course, the learner will be able to –

1. Understand the basic concept and importance of Consumer Education
2. Grasp the concepts related to Consumer Education and Protection
3. Analyse the regulations and redressal mechanism system
4. Aware of consumer movements

Unit –I (06 Hrs)

Concept of consumers and markets, concept of retail price, whole sale price, maximum retail price, local taxes, fair price and packaging.

Unit –II (06 Hrs)

Consumer protection act 1986, objectives and provisions, Grievances redress mechanism under consumer protection act 1986, procedure for filing and hearing a complaint, remedies, frivolous and vexatious complaints, offences and penalties.

Unit –III (06Hrs)

Industry regulations and consumer complaint redressal mechanism, Banking – RBI and banking ombudsman, Insurance – IRDA and insurance ombudsman, Telecommunication – TRAI, Food products – FSSAI, Advertising – ASCI

Unit –IV (06 Hrs)

Evolution of consumer movements in India, their role in consumer protection, national consumer citizen charter

Reference Books:

1. Consumer Protection: Law and Practice, V. K. Agarwal, Bharat Law House Pvt. Ltd., 2021
2. Consumer Affairs, Sri Ram Khanna, Savita Hanspal, Sheetal Kapoor, H. K. Awasthi, rient Blackswan, 2007
3. Textbook on Consumer Protection Law, Dr. H.K. Saharay, Universal Law, Publications, 2017
4. Consumer Protection and Redressal Mechanism, Atul Sharma and Arti Sharma, Global Vision Publication, 2019