VISVESVARAYA TECHNOLOGICAL UNIVERSITY
BELAGAVI

3rd to 8th Semester BE- Electronics & Communication
Scheme of Teaching and Examinations
(31-05-19)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2018 – 19)

B.E: Electronics & Communication Engineering

Program Outcomes (POs)

At the end of the B.E program, students are expected to have developed the following outcomes.

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSOs)

At the end of the B.E Electronics & Communication Engineering program, students are expected to have developed the following program specific outcomes.

PSO1: Specify, design, build and test analog and digital systems for signal processing including multimedia applications, using suitable components or simulation tools.

PSO2: Understand and architect wired and wireless analog and digital communication systems as per specifications, and determine their performance.

Note

1. The Course Outcomes and RBT levels indicated for each course in the syllabus are indicative/suggestive. The faculty can set them appropriately according to their lesson plan.

2. The Question Paper format for the theory courses is as follows:

   Question Paper Pattern for Theory Courses (2018 Scheme):

   - Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks
   - Each full question can have a maximum of 4 sub questions.
   - There will be 2 full questions from each module covering all the topics of the module.
   - Students will have to answer 5 full questions, selecting one full question from each module.
   - The total marks will be proportionally reduced to 60 marks as SEE marks is 60

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI
Scheme of Teaching and Examination 2018 – 19
Outcome Based Education(OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2018 – 19)

III SEMESTER

Sl. No	Course and Course Code		Course Title	Teaching Department	Teaching Hours /Week			Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P					
1	BSC	18MAT31	Mathematics (Title as per the decision of BoS in Sciences)	Mathematics	2	2	--	03	40	60	100	3
2	PCC	18EC32	Network Theory		3	2	--	03	40	60	100	4
3	PCC	18EC33	Electronic Devices		3	0	--	03	40	60	100	3
4	PCC	18EC34	Digital System Design		3	0	--	03	40	60	100	3
5	PCC	18EC35	Computer Organization & Architecture		3	0	--	03	40	60	100	3
6	PCC	18EC36	Power Electronics & Instrumentation		3	0	--	03	40	60	100	3
7	PCC	18ECL37	Electronic Devices & Instrumentation Laboratory		--	2	2	03	40	60	100	2
8	PCC	18ECL38	Digital System Design Laboratory		--	2	2	03	40	60	100	2
9	HSMC	18KVK39/49	Vyavaharika Kannada (Kannada for communication)/	HSMC	--	2	--	--	100	--	100	1
		18KAK39/49	Aadalitha Kannada (Kannada for Administration)									
		OR										
		18CPC39/49	Constitution of India, Professional Ethics and Cyber Law		1	--	--	03	40	60		
					Examination is by objective type questions							
				TOTAL	**17 OR 18**	**10 OR 08**	**04**	**24 OR 27**	**420 OR 360**	**480 OR 540**	**900**	**24**

Note: BSC: Basic Science, PCC: Professional Core, HSMC: Humanity and Social Science, NCMC: Non-credit mandatory course.

18KVK39 Vyavaharika Kannada (Kannada for communication) is for non-kannada speaking, reading and writing students and 18KAK39 Aadalitha Kannada (Kannada for Administration) is for students who speak, read and write kannada.

Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs

10	NC MC	18MATDIP31	Additional Mathematics - I	Mathematics	02	01	--	03	40	60	100	0

(a)The mandatory non – credit courses Additional Mathematics I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of BE/B.Tech programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the University examination. In case, any student fails to register for the said course/ fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the students have to fulfill the requirements during subsequent semester/s to appear for SEE.

(b) These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.

Courses prescribed to lateral entry B. Sc degree holders admitted to III semester of Engineering programs

Lateral entrant students from B.Sc. Stream, shall clear the non-credit courses Engineering Graphics and Elements of Civil Engineering and Mechanics of the First Year Engineering Programme. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.

AICTE Activity Points to be earned by students admitted to BE/B.Tech/B. Plan day college programme (For more details refer to Chapter 6,AICTE Activity Point Programme, Model Internship Guidelines):

Over and above the academic grades, every Day College regular student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Programme. Students transferred from other Universities to fifth semester are required to earn 50 Activity Points from the year of entry to VTU. The Activity Points earned shall be reflected on the student's eighth semester Grade Card.

The activities can be can be spread over the years, anytime during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the programme. However, minimum hours' requirement should be fulfilled. Activity Points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression.

In case students fail to earn the prescribed activity Points, Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of degree only after the release of the Eighth semester Grade Card.

BE 2018 SCHEME THIRD SEMESTER SYLLABUS EC / TC

TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES
(Common to all Branches)
SEMESTER – III (EC / TC)
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**18MAT31**	**CIE Marks**	**40**
Number of Lecture Hours/ Week	**02 + 2 (Tutorial)**	**SEE marks**	**60**
Total Number of LectureHours	**40 (08 Hours per Module)**	**Exam Hours**	**03**

CREDITS – 03

Course objectives: This course will enable students to:

- Have an insight into Fourier series, Fourier transforms, Laplace transforms, Difference equations and Z-transforms.
- Develop the proficiency in variational calculus and solving ODE's arising in engineering applications, using numerical methods.

Modules	**RBT Level**
Module - 1	
Laplace Transform: Definition and Laplace transforms of elementary functions (statements only). Laplace transforms of Periodic functions (statement only) and unit-step function – problems. **Inverse Laplace Transform:** Definition and problems, Convolution theorem to find the inverse Laplace transforms (without Proof) and problems. Solution of linear differential equations using Laplace transforms.	**L1, L2**
Module - 2	
Fourier Series: Periodic functions, Dirichlet's condition. Fourier series of periodic functions period 2π and arbitrary period. Half range Fourier series. Practical harmonic analysis.	**L1, L2**
Module – 3	
Fourier Transforms: Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms. Problems. **Difference Equations and Z-Transforms:**Difference equations, basic definition, z-transform-definition, Standard z-transforms, Damping and shifting rules, initial value and final value theorems (without proof) and problems, Inverse z-transform and applications to solve difference equations.	**L1, L2**
Module - 4	
Numerical Solutions of Ordinary Differential Equations(ODE's): Numerical solution of ODE's of first order and first degree- Taylor's series method, Modified Euler's method. Runge - Kutta method of fourth order, Milne's and Adam-Bashforth predictor and corrector method (No derivations of formulae)-Problems.	**L1, L2**
Module - 5	

Numerical Solution of Second Order ODE's: Runge-Kutta method and Milne's predictor and corrector method. (No derivations of formulae). **Calculus of Variations:** Variation of function and functional, variational problems, Euler's equation, Geodesics, hanging chain - Problems.	**L1, L2, L3**

Course Outcomes: At the end of the course, the students will be ableto

- Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering.
- Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.
- Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems.
- Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.
- Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

Question paper pattern:

- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

Text Books:

1. E. Kreyszig - Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2016.
2. B.S. Grewal -Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
3. Srimanta Pal et al - Engineering Mathematics, Oxford University Press, 3rd Edition, 2016.

Reference Books:

1. C.Ray Wylie, Louis C.Barrett - Advanced Engineering Mathematics, McGraw-Hill Book Co, 6th Edition, 1995.
2. S.S.Sastry - Introductory Methods of Numerical Analysis, Prentice Hall of India, 4th Edition 2010.
3. B.V.Ramana - Higher Engineering Mathematics, McGraw-Hill, 11th Edition, 2010.
4. N.P.Bali and Manish Goyal - A Text Book of Engineering Mathematics, LaxmiPublications, 6th Edition, 2014.

NETWORK THEORY
SEMESTER – III (EC / TC)

[As per Choice Based Credit System (CBCS) scheme]

Subject Code	18EC32	CIE Marks	40
Number of Lecture Hours/Week	03 + 2 (Tutorial)	SEE marks	60
		Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to:

- Describe basic network concepts emphasizing source transformation, source shifting, mesh and nodal techniques to solve for resistance/impedance, voltage, current and power.
- Explain network Thevenin's, Millman's, Superposition, Reciprocity, Maximum Power transfer and Norton's Theorems and apply them in solving the problems related to Electrical Circuits.
- Explain the behavior of networks subjected to transient conditions.
- Use applications of Laplace transforms to network problems.
- Study two port network parameters like Z, Y, T and h and their inter-relationships and applications

Modules	RBT Level
Module – 1	
Basic Concepts: Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis with linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh, source transformation.	**L1, L2, L3, L4**
Module – 2	
Network Theorems: Superposition, Reciprocity, Millman's theorems, Thevinin's and Norton's theorems, Maximum Power transfer theorem.	**L1, L2, L3, L4**
Module – 3	
Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations.	**L1 , L2 , L3**
Module – 4	
Laplace Transformation & Applications: Solution of networks, step, ramp and impulse responses, waveform Synthesis.	**L1, L2, L3, L4**
Module – 5	
Two port network parameters: Definition of Z, Y, h and Transmission parameters, modelling with these parameters, relationship between parameters sets.	**L1, L2, L3, L4**

Course Outcomes: At the end of the course, the students will be ableto

- Determine currents and voltages using source transformation/ source shifting/ mesh/ nodal analysis and reduce given network using star-delta transformation/source transformation/ source shifting.
- Solve network problems by applying Superposition/ Reciprocity/ Thevenin's/ Norton's/ Maximum Power Transfer/ Millman's Network Theorems and electrical laws to reduce circuit complexities and to arrive at feasible solutions.
- Calculate current and voltages for the given circuit under transient conditions.
- Apply Laplace transform to solve the given network.
- Solve the given network using specified two port network parameter like Z or Y or Tor h.

Question paper pattern:

- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

Text Books:

1. M.E. Van Valkenberg (2000), ―Network analysis‖, Prentice Hall of India, 3rdedition, 2000, ISBN: 9780136110958.
2. Roy Choudhury, ―Networks and systems‖, 2nd edition, New Age InternationalPublications, 2006, ISBN: 9788122427677

Reference Books:

1. Hayt, Kemmerly and Durbin ―Engineering Circuit Analysis‖, TMH 7th Edition, 2010.
2. J. David Irwin /R. Mark Nelms, ―Basic Engineering Circuit Analysis‖, John Wiley, 8thed, 2006.
3. Charles K Alexander and Mathew N O Sadiku, ― Fundamentals of Electric Circuits‖, Tata McGraw-Hill, 3rd Ed, 2009.

ELECTRONIC DEVICES
SEMESTER – III (EC / TC)

[As per Choice Based Credit System (CBCS) scheme]

Course Code	**18EC33**	**CIE Marks**	**40**
Number of LectureHours/Week	**03**	**SEE marks**	**60**
Total Number ofLecture Hours	**40 (8 Hours / Module)**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: This course will enable students to:

- Understand the basics of semiconductor physics and electronic devices.
- Describe the mathematical models BJTs and FETs along with the constructional details.
- Understand the construction and working principles of optoelectronic devices
- Understand the fabrication process of semiconductor devices and CMOS process integration.

Module-1	**RBT Level**
Semiconductors Bonding forces in solids, Energy bands, Metals, Semiconductors and Insulators, Direct and Indirect semiconductors, Electrons and Holes, Intrinsic and Extrinsic materials, Conductivity and Mobility, Drift and Resistance, Effects of temperature and doping on mobility, Hall Effect. **(Text 1: 3.1.1, 3.1.2, 3.1.3, 3.1.4, 3.2.1, 3.2.3, 3.2.4, 3.4.1, 3.4.2, 3.4.3, 3.4.5).**	**L1,L2**
Module-2	
P-N Junctions Forward and Reverse biased junctions- Qualitative description of Current flow at a junction, reverse bias, Reverse bias breakdown-Zener breakdown, avalanche breakdown, Rectifiers. **(Text 1: 5.3.1, 5.3.3, 5.4, 5.4.1, 5.4.2, 5.4.3)** Optoelectronic Devices Photodiodes: Current and Voltage in an Illuminated Junction, Solar Cells, Photodetectors. Light Emitting Diode: Light Emitting materials**.(Text 1: 8.1.1, 8.1.2, 8.1.3, 8.2, 8.2.1)**	**L1,L2**
Module – 3	
Bipolar Junction Transistor Fundamentals of BJT operation, Amplification with BJTS, BJT Fabrication, The coupled Diode model (Ebers-Moll Model), Switching operation of a transistor, Cutoff, saturation, switching cycle, specifications, Drift in the base region, Base narrowing, Avalanche breakdown, Base Resistance and Emitter crowding. **(Text 1: 7.1, 7.2, 7.3, 7.5.1, 7.6, 7.7.1, 7.7.2, 7.7.3, 7.7.5).**	**L1,L2**
Module-4	
Field Effect Transistors Basic pn JFET Operation, Equivalent Circuit and Frequency Limitations, MOSFET- Two terminal MOS structure- Energy band diagram, Ideal Capacitance – Voltage Characteristics and Frequency Effects, Basic MOSFET Operation- MOSFET structure, Current-Voltage Characteristics.	**L1,L2**

(Text 2: 9.1.1, 9.4, 9.6.1, 9.6.2, 9.7.1, 9.7.2, 9.8.1, 9.8.2).	
Module-5	
Fabrication of p-n junctions Thermal Oxidation, Diffusion, Rapid Thermal Processing, Ion implantation, chemical vapour deposition, photolithography, Etching, metallization. **(Text 1: 5.1)** **Integrated Circuits** Background, Evolution of ICs, CMOS Process Integration, Integration of Other Circuit Elements. **(Text 1: 9.1, 9.2, 9.3.1, 9.3.2).**	**L1,L2**
Course outcomes: After studying this course, students will be able to: • Understand the principles of semiconductor Physics • Understand the principles and characteristics of different types of semiconductor devices • Understand the fabrication process of semiconductor devices • Utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.	

Question paper pattern:

- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

Text Books:

1. Ben. G. Streetman, Sanjay Kumar Banergee, "Solid State Electronic Devices", 7thEdition, Pearson Education, 2016, ISBN 978-93-325-5508-2.
2. Donald A Neamen, Dhrubes Biswas, "Semiconductor Physics and Devices", 4th Edition, MCGraw Hill Education, 2012, ISBN 978-0-07-107010-2.

Reference Book:

1. S. M. Sze, Kwok K. Ng, "Physics of Semiconductor Devices", 3rd Edition, Wiley, 2018.
2. A. Bar-Lev, "Semiconductor and Electronic Devices", 3rd Edition, PHI, 1993.

DIGITAL SYSTEM DESIGN
SEMESTER – III (EC/TC)
[As per Choice Based Credit System (CBCS) Scheme]

Course Code	18EC34	CIE Marks	40
Number of LectureHours/Week	03	SIE Marks	60
Total Number of Lecture Hours	40 (08 Hours per Module)	Exam Hour	03

CREDITS – 03

Course objectives: This course will enable students to:

- Illustrate simplification of Algebraic equations using Karnaugh Maps and Quine-McClusky Techniques.
- Design Decoders, Encoders, Digital Multiplexer, Adders, Subtractors and Binary Comparators.
- Describe Latches and Flip-flops, Registers and Counters.
- Analyze Mealy and Moore Models.
- Develop state diagrams Synchronous Sequential Circuits.
- Appreciate the applications of digital circuits.

Module – 1	RBT Level
Principles of combinational logic: Definition of combinational logic, canonical forms, Generation of switching equations from truth tables, Karnaugh maps-3,4,5 variables, Incompletely specified functions (Don‘t care terms) Simplifying Max term equations, Quine-McClusky techniques – 3 & 4 variables. **(Text 1 - Chapter 3)**	**L1, L2, L3**
Module – 2	
Analysis and design of combinational logic: Decoders, Encoders, Digital multiplexers, Adders and subtractors, Look ahead carry, Binary comparators. **(Text 1 - Chapter 4).** Programmable Logic Devices, Complex PLD, FPGA. **(Text 3 - Chapter 9, 9.6 to 9.8)**	**L1, L2, L3**
Module -3	
Flip-Flops and its Applications: Basic Bistable elements, Latches, The master-slave flip-flops (pulse-triggered flip-flops): SR flip-flops, JK flip-flops, Characteristic equations, Registers, binary ripple counters, and synchronous binary counters. **(Text 2 - Chapter 6)**	**L1, L2, L3**
Module -4	
Sequential Circuit Design: Design of a synchronous counter, Design of a synchronous mod-n counter using clocked JK, D, T and SR flip-flops. **(Text 2 - Chapter 6)** Mealy and Moore models, State machine notation, Construction of state diagrams. **(Text 1 - Chapter 6)**	**L1, L2, L3**

Module -5	
Applications of Digital Circuits: Design of a Sequence Detector, Guidelines for construction of state graphs, Design Example – Code Converter, Design of Iterative Circuits (Comparator), Design of Sequential Circuits using ROMs and PLAs, CPLDs and FPGAs, Serial Adder with Accumulator, Design of Binary Multiplier, Design of Binary Divider. **(Text 3 – 14.1, 14.3, 16.2, 16.3, 16.4, 18.1, 18.2, 18.3)**	**L1, L2, L3**

Course Outcomes: After studying this course, students will be able to:

- Explain the concept of combinational and sequential logic circuits.
- Design the combinational logic circuits.
- Design the sequential circuits using SR, JK, D, T flip-flops and Mealy & Moore machines
- Design applications of Combinational & Sequential Circuits.

Question paper pattern:

- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

Text Books:

1. John M Yarbrough,-Digital Logic Applications and Design, Thomson Learning,2001.
2. Donald D. Givone, ―Digital Principles and Design‖, McGraw Hill, 2002.
3. Charles H Roth Jr., Larry L. Kinney ―Fundamentals of Logic Design, Cengage Learning, 7th Edition.

Reference Books:

1. D. P. Kothari and J. S Dhillon, ―Digital Circuits and Design‖, Pearson, 2016,
2. Morris Mano, ―Digital Design‖, Prentice Hall of India, Third Edition.
3. K. A. Navas, ―Electronics Lab Manual‖, Volume I, PHI, 5th Edition, 2015.

COMPUTER ORGANIZATION AND ARCHITECTURE
SEMESTER – III (EC/TC)

[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**18EC35**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (08Hours per Module)**	**Exam Hours**	**03**

CREDITS– 03

Course Objectives: This course will enable students to:

- Explain the basic sub systems of a computer, their organization, structure and operation.
- Illustrate the concept of programs as sequences of machine instructions.
- Demonstrate different ways of communicating with I/O devices
- Describe memory hierarchy and concept of virtual memory.
- Illustrate organization of simple pipelined processor and other computing systems.

Module 1	**RBT Level**
Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance – Processor Clock, Basic Performance Equation **(upto 1.6.2 of Chap 1 of Text).** **Machine Instructions and Programs:** Numbers, Arithmetic Operations and Characters, IEEE standard for Floating point Numbers, Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing **(upto 2.4.6 of Chap 2 and 6.7.1 of Chap 6 of Text).**	**L1, L2, L3**
Module 2	
Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions **(from 2.4.7 of Chap 2, except 2.9.3, 2.11 & 2.12 of Text).**	**L1, L2, L3**
Module 3	
Input/Output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Direct Memory Access **(upto 4.2.4 and 4.4 except 4.4.1 of Chap 4 of Text).**	**L1, L2, L3**
Module 4	
Memory System: Basic Concepts, Semiconductor RAM Memories-Internal organization of memory chips, Static memories, Asynchronous DRAMS, Read Only Memories, Cash Memories, Virtual Memories, Secondary Storage-Magnetic Hard Disks **(5.1, 5.2, 5.2.1, 5.2.2, 5.2.3, 5.3, 5.5 (except 5.5.1 to 5.5.4), 5.7 (except 5.7.1), 5.9, 5.9.1 of Chap 5 of Text).**	**L1, L2, L3**

Module 5	
Basic Processing Unit: Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hardwired Control, Microprogrammed Control **(upto 7.5 except 7.5.1 to 7.5.6 of Chap 7 of Text).**	**L1,L2, L3**

Course Outcomes: After studying this course, students will be able to:

- Explain the basic organization of a computer system.
- Explain different ways of accessing an input / output device including interrupts.
- Illustrate the organization of different types of semiconductor and other secondary storage memories.
- Illustrate simple processor organization based on hardwired control and micro programmed control.

Question paper pattern:

- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

Text Book:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, Tata McGraw Hill, 2002.

Reference Books:

1. David A. Patterson, John L. Hennessy: Computer Organization and Design – The Hardware / Software Interface ARM Edition, 4th Edition, Elsevier, 2009.
2. William Stallings: Computer Organization & Architecture, 7th Edition, PHI, 2006.
3. Vincent P. Heuring & Harry F. Jordan: Computer Systems Design and Architecture, 2nd Edition, Pearson Education, 2004.

POWER ELECTRONICS AND INSTRUMENTATION
SEMESTER – III (EC/TC)
[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**18EC36**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours/ Module)**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: This course will enable students to:

- Study and analysis of thyristor circuits with different triggering conditions.
- Learn the applications of power devices in controlled rectifiers, converters and inverters.
- Understand types of instrument errors.
- Develop circuits for multirange Ammeters and Voltmeters.
- Describe principle of operation of digital measuring instruments and Bridges.
- Understand the operation of Transducers, Instrumentation amplifiers and PLCs.

Module-1	**RBT Level**
Introduction: History, Power Electronic Systems, Power Electronic Converters and Applications. **Thyristors:** Static Anode-Cathode characteristics and Gate characteristics of SCR, Turn-ON methods, Turn-OFF mechanisms, Turn-OFF Methods: Natural and Forced Commutation – Class A and Class B types, Gate Trigger Circuit: Resistance Firing Circuit, Resistance capacitance firing circuit, Unijunction Transistor: Basic operation and UJT Firing Circuit. **(Text 1)**	**L1, L2**
Module-2	
Phase Controlled Converter: Control techniques, Single phase half wave and full wave controlled rectifier with resistive and inductive loads, effect of freewheeling diode. **Choppers:** Chopper Classification, Basic Chopper operation: step-down, step-up and step-up/down choppers. **(Text 1)**	**L1,L2, L3**
Module-3	
Inverters: Classification, Single phase Half bridge and full bridge inverters with RL load. **Switched Mode Power Supplies**: Isolated Flyback Converter, Isolated Forward Converter.(Text 1) **Principles of Measurement:** Static Characteristics, Error in Measurement, Types of Static Error. **(Text 2: 1.2-1.6)** Multirange Ammeters, Multirange voltmeter. **(Text 2: 3.2, 4.4)**	**L1,L2, L3**
Module-4	

Digital Voltmeter: Ramp Technique, Dual slope integrating Type DVM, Direct Compensation type and Successive Approximations type DVM **(Text 2: 5.1-5.3, 5.5, 5.6)** **Digital Multimeter:** Digital Frequency Meter and Digital Measurement of Time, Function Generator. **Bridges:** Measurement of resistance: Wheatstone's Bridge, AC Bridges-Capacitance and Inductance Comparison bridge, Wien's bridge. **(Text 2: refer 6.2, 6.3 upto 6.3.2, 6.4 upto 6.4.2, 8.8, 11.2, 11.8-11.10, 11.14).**	**L1, L2**
Module-5	
Transducers: Introduction, Electrical Transducer, Resistive Transducer, Resistive position Transducer, Resistance Wire Strain Gauges, Resistance Thermometer, Thermistor, LVDT. **(Text 2: 13.1-13.3, 13.5, 13.6 upto 13.6.1, 13.7, 13.8, 13.11).** Instrumentation Amplifier using Transducer Bridge, Temperature indicators using Thermometer, Analog Weight Scale **(Text 2: 14.3.3, 14.4.1, 14.4.3).** **Programmable Logic Controller:** Structure, Operation, Relays and Registers **(Text 2: 21.15, 21.15.2, 21.15.3, 21.15.5, 21.15.6).**	**L1,L2, L3**

Course Outcomes: At the end of the course students should be able to:

- Build and test circuits using power electronic devices.
- Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters and SMPS.
- Define instrument errors.
- Develop circuits for multirange Ammeters, Voltmeters and Bridges to measure passive component values and frequency.
- Describe the principle of operation of Digital instruments and PLCs.
- Use Instrumentation amplifier for measuring physical parameters.

Question paper pattern:

- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

Text Books:

1. M.D Singh and K B Khanchandani, Power Electronics, 2nd Edition, Tata Mc-Graw Hill, 2009, ISBN: 0070583897
2. H. S. Kalsi, "Electronic Instrumentation", McGraw Hill, 3rd Edition, 2012, ISBN: 9780070702066.

Reference Books:

1. Mohammad H Rashid, Power Electronics, Circuits, Devices and Applications, 3rd/4th Edition, Pearson Education Inc, 2014, ISBN: 978-93-325-1844-5.
2. L. Umanand, Power Electronics, Essentials and Applications, John Wiley

India Pvt. Ltd, 2009.
3. David A. Bell, “Electronic Instrumentation & Measurements”, Oxford University Press PHI 2nd Edition, 2006, ISBN 81-203-2360-2.
4. A. D. Helfrick and W.D. Cooper, “Modern Electronic Instrumentation and Measuring Techniques”, Pearson, 1st Edition, 2015, ISBN: 9789332556065.

ELECTRONIC DEVICES AND INSTRUMENTATION LABORATORY
SEMESTER – III (EC/TC)
[As per Choice Based Credit System (CBCS) scheme]

Laboratory Code	**18ECL37**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**02 Hr Tutorial (Instructions) + 02 Hours Laboratory**	**SEE Marks**	**60**
RBT Level	**L1, L2, L3**	**Exam Hours**	**03**

CREDITS – 02

Course objectives: This laboratory course enables students to

- Understand the circuit schematic and its working
- Study the characteristics of different electronic devices
- Design and test simple electronic circuits as per the specifications using discrete electronic components.
- Familiarize with EDA software which can be used for electronic circuit simulation.

Laboratory Experiments

PART A : Experiments using Discrete components

1. Conduct experiment to test diode clipping (single/double ended) and clamping circuits (positive/negative)
2. Half wave rectifier and Full wave rectifier with and without filter and measure the ripple factor
3. Characteristics of Zener diode and design a Simple Zener voltage regulator determine line and load regulation
4. Characteristics of LDR and Photo diode and turn on an LED using LDR
5. Static characteristics of SCR.
6. SCR Controlled HWR and FWR using RC triggering circuit
7. Conduct an experiment to measure temperature in terms of current/voltage using a temperature sensor bridge.
8. Measurement of Resistance using Wheatstone and Kelvin's bridge.

PART-B : Simulation using EDA software
(EDWinXP, PSpice, MultiSim, Proteus, CircuitLab or any equivalent tool)

1. Input and Output characteristics of BJT Common emitter configuration and evaluation of parameters.
2. Transfer and drain characteristics of a JFET and MOSFET.
3. UJT triggering circuit for Controller Rectifiers.

4. Design and simulation of Regulated power supply.

Course Outcomes: On the completion of this laboratory course, the students will be able to:

- Understand the characteristics of various electronic devices and measurement of parameters.
- Design and test simple electronic circuits
- Use of circuit simulation software for the implementation and characterization of electronic circuits and devices.

Conduct of Practical Examination:

- All laboratory experiments are to be considered for practical examination.
- For examination one question from **PART-A** and one question from **PART-B or** only one question from **PART-A** experiments based on the complexity, to be set.
- Students are allowed to pick one experiment from the lot.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
- Change of experiment is allowed only once and Marks allotted to the procedure part to be made zero.

Reference Books:

1. David A Bell, "Fundamentals of Electronic Devices and Circuits Lab Manual, 5th Edition, 2009, Oxford University Press.
2. Muhammed H Rashid, "Introduction to PSpice using OrCAD for circuits and electronics", 3rd Edition, Prentice Hall, 2003.

DIGITAL SYSTEM DESIGN LABORATORY
SEMESTER – III (EC/TC)

[As per Choice Based Credit System (CBCS) Scheme]

Laboratory Code	**18ECL38**	**IA Marks**	**40**
Number of Lecture Hours / Week	**02 Hr Tutorial (Instructions) + 02 Hours Laboratory**	**Exam Mark**	**60**
		Exam Hour	**03**

CREDITS – 02

Course objectives: This laboratory course enables students to get practical experience in design, realization and verification of

- Demorgan's Theorem, SOP, POS forms
- Full / Parallel Adders, Subtractors and Magnitude Comparator
- Multiplexer using logicgates
- Demultiplexers and Decoders
- Flip-Flops, Shift registers and Counters.

NOTE:	**Revised Bloom's Taxonomy (RBT) Level**
1. Use discrete components to test and verify the logic gates. The IC numbers given are suggestive; any equivalent ICs can beused. 2. For experiment No. 11 and 12 any open source or licensed simulation tool may be used.	
Laboratory Experiments:	
1. Verify (i) Demorgan's Theorem for 2 variables. (ii) The sum-of product and product-of-sum expressions using universal gates.	**L1, L2, L3**
2. Design and implement (i) Half Adder & Full Adder using i) basic gates. ii) NAND gates (ii) Half subtractor& Full subtractor using i) basic gates ii) NAND gates	**L3, L4**
3. Design and implement (i) 4-bitParallelAdder / Subtractor using IC 7483. (ii) BCD to Excess-3 code conversion and vice-versa.	**L3, L4**
4. Design and Implementation of (i) 1-bit Comparator (ii) 5-bit Magnitude Comparator using IC 7485.	**L3, L4**
5. Realize (i) Adder & Subtactors using IC 74153. (ii) 4-variable function using IC74151(8:1MUX).	**L2, L3, L4**
6. Realize (i) Adder & Subtractors using IC74139. (ii) Binary to Gray code conversion & vice-versa (74139)	**L2, L3, L4**

7. Realize the following flip-flops using NANDGates. Master-Slave JK, D & T Flip-Flop.	**L2, L3**
8. Realize the following shift registers using IC7474/7495 (i) SISO (ii) SIPO (iii)) PISO(iv))PIPO (v) Ring (vi) Johnson counter	**L2, L3**
9. Realize (i) Design Mod – N Synchronous Up Counter & Down Counter using 7476 JK Flip-flop (ii) Mod-N Counter using IC7490 / 7476 (iii) Synchronous counter using IC74192	**L2, L3**
10. Design Pseudo Random Sequence generator using 7495.	**L2, L3**
11. Design Serial Adder with Accumulator andSimulate using Simulation tool.	**L2, L3, L4**
12. Design Binary Multiplier and Simulate using Simulation tool.	**L2, L3, L4**

Course outcomes: On the completion of this laboratory course, the students will be able to:

- Demonstrate the truth table of various expressions and combinational circuits using logicgates.
- Design various combinational circuits suchas adders, subtractors, comparators, multiplexers and demultiplexers.
- Construct flips-flops, counters and shiftregisters.
- Simulate Serial adder and Binary Multiplier.

Conduct of Practical Examination:

- All laboratory experiments are to be includedforpractical examination.
- Students are allowed to pick one experiment from thelot.
- Strictly follow the instructions as printed on the cover page of answer script for breakup ofmarks.
- Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be madezero.

ADDITIONAL MATHEMATICS – I

(A Bridge course for Lateral Entry students under Diploma quota to BE/B.Tech programmes)

[As per Choice Based Credit System (CBCS) scheme]

Course Code	**18MATDIP31**	**CIE Marks**	**40**
Number of Lecture Hours/ Week	**02 + 1 (Tutorial)**	**SEE marks**	**60**
Total Number of LectureHours	**40 (08 Hours per Module)**	**Exam Hours**	**03**

CREDITS – 0

Course objectives: This course will enable students to:

- Provide basic concepts of complex trigonometry, vector algebra, differential and integral calculus.
- Provide an insight into vector differentiation and first order ODE's.

Modules	**RBT Level**
Module - 1	
Complex Trigonometry: Complex Numbers: Definitions and properties. Modulus and amplitude of a complex number, Argand's diagram, De-Moivre's theorem (without proof). **Vector Algebra:**Scalar and vectors. Addition and subtraction and multiplication of vectors- Dot and Cross products -Problems.	**L1, L2**
Module - 2	
Differential Calculus: Review of successive differentiation-illustrative examples. Maclaurin's series expansions-Illustrative examples. Partial **Differentiation:** Euler's theorem-problems on first order derivatives only. Total derivatives-differentiation of composite functions. Jacobians of order two-Problems.	**L1, L2**
Module – 3	
Vector Differentiation: Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl-simple problems. Solenoidal and irrotational vector fields-Problems.	**L1, L2**
Module - 4	
Integral Calculus: Review of elementary integral calculus. Reduction formulae for sinnx, cosnx (with proof) and sinmxcosnx (without proof) and evaluation of these with standard limits-Examples. Double and triple integrals-Simple examples.	**L1, L2**
Module - 5	
Ordinary differential equations (ODE's). Introduction-solutions of first order and first degree differential equations: exact, linear differential equations. Equations reducible to exact and Bernoulli's equation.	**L1, L2**

Course Outcomes: At the end of the course, the students will be ableto

- CO1: Apply concepts of complex numbers and vector algebra to analyze the problems arising in related area.
- CO2: Use derivatives and partial derivatives to calculate rate of change of multivariate functions.
- CO3: Analyze position, velocity and acceleration in two and three dimensions of vector valued functions.
- CO4: Learn techniques of integration including the evaluation of double and triple integrals.
- CO5: Identify and solve first order ordinary differential equations.

Question paper pattern:

- Examination will be conducted for 100 marks with question paper containing 10 full questions, each of 20 marks.
- Each full question can have a maximum of 4 sub questions.
- There will be 2 full questions from each module covering all the topics of the module.
- Students will have to answer 5 full questions, selecting one full question from each module.
- The total marks will be proportionally reduced to 60 marks as SEE marks is 60.

Text Books:

1. B.S. Grewal - Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2015.

Reference Books:

1. E. Kreyszig - Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2015.
2. N.P.Bali and Manish Goyal - Engineering Mathematics, Laxmi Publishers, 7th Edition, 2007.
3. RohitKhurana - Engineering Mathematics Vol.I, Cengage Learning, 1st Edition, 2015.

CONSTITUTION of INDIA, PROFESSIONAL ETHICS and CYBER LAW (CPC)
(Common to all Branches)
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**18CPC39/49**	**CIE Marks**	**40**
Number of Lecture Hours/ Week	**02 (Tutorial)**	**SEE marks**	**60**
		Exam Hours	**03**

CREDITS – 01

Course objectives: This course will enable students to:

- To know the fundamental political codes, structure, procedures, powers, and duties of Indian government institutions, fundamental rights, directive principles, and the duties of citizens
- To understand engineering ethics and their responsibilities, identify their individual roles and ethical responsibilities towards society.
- To know about the cybercrimes and cyber laws for cyber safety measures.

Modules	**RBT Level**
Module - 1	
Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India. Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building.	**L1, L2, L3**
Module - 2	
Union Executive and State Executive: Parliamentary System, Federal System, Centre-State Relations. Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism. State Executives – Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Special Provisions (Articles 370.371,371J) for some States.	**L1, L2, L3**
Module – 3	
Elections, Amendments and Emergency Provisions: Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments - Methods in Constitutional Amendments (How and Why) and Important Constitutional Amendments. Amendments – 7,9,10,12,42,44, 61, 73,74, ,75, 86, and 91,94,95,100,101,118 and some important Case Studies. Emergency Provisions, types of Emergencies and its consequences. **Constitutional special provisions:** Special Provisions for SC and ST, OBC, Women, Children and	**L1, L2, L3**

Backward Classes.	
Module - 4	
Professional / Engineering Ethics: Scope & Aims of Engineering & Professional Ethics - Business Ethics, Corporate Ethics, Personal Ethics. Engineering and Professionalism, Positive and Negative Faces of Engineering Ethics, Code of Ethics as defined in the website of Institution of Engineers (India): Profession, Professionalism, and Professional Responsibility. Clash of Ethics, Conflicts of Interest. Responsibilities in Engineering Responsibilities in Engineering and Engineering Standards, the impediments to Responsibility. Trust and Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liability in Engineering.	**L1, L2, L3**
Module - 5	
Internet Laws, Cyber Crimes and Cyber Laws: Internet and Need for Cyber Laws, Modes of Regulation of Internet, Types of cyber terror capability, Net neutrality, Types of Cyber Crimes, India and cyber law, Cyber Crimes and the information Technology Act 2000, Internet Censorship. Cybercrimes and enforcement agencies.	**L1, L2, L3**

Course Outcomes: At the end of the course, the students will be able to

- Have constitutional knowledge and legal literacy.
- Understand Engineering and Professional ethics and responsibilities of Engineers.
- Understand the cybercrimes and cyber laws for cyber safety measures.

Question paper pattern:

- The SEE question paper will be set for 100 marks and the marks scored by the students will proportionately be reduced to 60. The pattern of the question paper will be objective type (MCQ).
- For the award of 40 CIE marks, refer the University regulations 2018.

Text Books:

1. Shubham Singles, Charles E. Haries, and et al: "Constitution of India, Professional Ethics and Human Rights" by Cengage Learning India, Latest Edition – 2019.
2. Alfred Basta and et al: "Cyber Security and Cyber Laws" by Cengage Learning India - 2018. Chapter – 19, Page No's: 359 to 383.

Reference Books:

1. Durga Das Basu (DD Basu): "Introduction to the Constitution of India", (Students Edition.) Prentice –Hall, 2008.
2. M.Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engineering Ethics", Prentice –Hall, 2004.