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)

IV 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	18MAT41	Mathematics (Title as per the decision of BoS in Sciences)	Mathematics	2	2	--	03	40	60	100	3
2	PCC	18EC42	Analog Circuits		3	2	--	03	40	60	100	4
3	PCC	18EC43	Control Systems		3	0	--	03	40	60	100	3
4	PCC	18EC44	Engineering Statistics & Linear Algebra		3	0	--	03	40	60	100	3
5	PCC	18EC45	Signals & Systems		3	0	--	03	40	60	100	3
6	PCC	18EC46	Microcontroller		3	0	--	03	40	60	100	3
7	PCC	18ECL47	Microcontroller Laboratory		--	2	2	03	40	60	100	2
8	PCC	18ECL48	Analog Circuits 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**	**10**	**04**	**24**	**420**	**480**	**900**	**24**
					OR	**OR**		**OR**	**OR**	**OR**		
					18	**08**		**27**	**360**	**540**		

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

18KVK39/49 Vyavaharika Kannada (Kannada for communication) is for non-kannada speaking, reading and writing students and 18KAK39/49 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	NCMC	18MATDIP41	Additional Mathematics – II	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 student 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: 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 Fourth Semester Syllabus EC / TC

COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS **SEMESTER – IV (EC/TC)** **[As per Choice Based Credit System (CBCS) scheme]**			
Course Code	**18MAT41**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**2+2 (Tutorial)**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (08 Hours per Module)**	**Exam Hours**	**03**
CREDITS – 03			

Course objectives: This course will enable students to:

- Provide an insight into applications of complex variables, conformal mapping and special functions arising in potential theory, quantum mechanics, heat conduction and field theory.
- Develop probability distribution of discrete, continuous random variables and joint probability distribution occurring in digital signal processing, design engineering and microwave engineering.

Modules	**RBT Level**
Module -1	
Calculus of complex functions: Review of function of a complex variable, limits, continuity, and differentiability. Analytic functions: Cauchy-Riemann equations in cartesian and polar forms and consequences. Construction of analytic functions: Milne-Thomson method-Problems.	**L1, L2**
Module -2	
Conformal transformations: Introduction. Discussion of transformations: $w=z^2$, $w=e^z$, $w=z+\frac{1}{z},(z\neq 0)$. Bilinear transformations- Problems. **Complex integration:** Line integral of a complex function-Cauchy's theorem and Cauchy's integral formula and problems.	**L1, L2**
Module -3	
Probability Distributions: Review of basic probability theory. Random variables (discrete and continuous), probability mass/density functions. Binomial, Poisson, exponential and normal distributions- problems (No derivation for mean and standard deviation)-Illustrative examples.	**L1, L2, L3**
Module -4	

Curve Fitting: Curve fitting by the method of least squares- fitting the curves of the form- $y = ax + b, y = ax^b$ & $y = ax^2 + bx + c.$ **Statistical Methods:** Correlation and regression-Karl Pearson's coefficient of correlation and rank correlation-problems. Regression analysis- lines of regression –problems.	**L1,L2, L3**
Module -5	
Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation and covariance. **Sampling Theory:** Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of hypothesis for means, student's t-distribution, Chi-square distribution as a test of goodness of fit.	**L2, L3, l4**

Course Outcomes: At the end of this course students will demonstrate the ability to

- Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.
- Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.
- Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.
- Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
- Construct joint probability distributions and demonstrate the validity of testing the hypothesis.

Question paper pattern:

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

Text Book:

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

Reference Books:

1. Advanced Engineering Mathematics, C.Ray Wylie, Louis C.Barrett, McGraw-

Hill, 6th Edition 1995.
2. Introductory Methods of Numerical Analysis, S.S.Sastry, Prentice Hall of India, 4th Edition 2010.
3. Higher Engineering Mathematics, B.V.Ramana, McGraw-Hill, 11th Edition, 2010.
4. A Text Book of Engineering Mathematics, N.P.Bali and Manish Goyal, Laxmi Publications, 6th Edition, 2014.

ANALOG CIRCUITS
SEMESTER – IV (EC/TC)
[As per Choice Based Credit System (CBCS) scheme]

Subject Code	**18EC42**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**3+2 (Tutorial)**	**SEE Marks**	**60**
		Exam Hours	**03**

CREDITS – 04

Course objectives: This course will enable students to:

- Explain various BJT parameters, connections and configurations.
- Design and demonstrate the diode circuits and transistor amplifiers.
- Explain various types of FET biasing, and demonstrate the use of FET amplifiers.
- Construct frequency response of FET amplifiers at various frequencies.
- Analyze Power amplifier circuits in different modes of operation.
- Construct Feedback and Oscillator circuits using FET.

Modules	**RBT Level**
Module -1	
BJT Biasing: Biasing in BJT amplifier circuits: The Classical Discrete circuit bias (Voltage-divider bias), Biasing using a collector to base feedback resistor. **Small signal operation and Models**: Collector current and transconductance, Base current and input resistance, Emitter current and input resistance, voltage gain, Separating the signal and the DC quantities, The hybrid Π model. **MOSFETs: Biasing in MOS amplifier circuits:** Fixing V_{GS}, Fixing V_G, Drain to Gate feedback resistor. **Small signal operation and modeling**: The DC bias point, signal current in drain, voltage gain, small signal equivalent circuit models, transconductance. **[Text 1: 3.5(3.5.1, 3.5.3), 3.6(3.6.1 to 3.6.6), 4.5(4.5.1, 4.5.2, 4.5.3), 4.6(4.6.1 to 4.6.6)]**	**L1, L2,L3**
Module -2	
MOSFET Amplifier configuration: Basic configurations, characterizing amplifiers, CS amplifier with and without source resistance R_S, Source follower. **MOSFET internal capacitances and High frequency model:** The gate capacitive effect, Junction capacitances, High frequency model. **Frequency response of the CS amplifier**: The three frequency bands, high frequency response, Low frequency response. **Oscillators:** FET based Phase shift oscillator, LC and Crystal Oscillators (no derivation) **[Text 1: 4.7(4.7.1 to 4.7.4, 4.7.6) 4.8(4.8.1, 4.8.2, 4.8.3), 4.9, 12.2.2, 12.3.1, 12,3,2]**	**L1, L2, L3**
Module -3	

Feedback Amplifier: General feedback structure, Properties of negative feedback, The Four Basic Feedback Topologies, The series-shunt, series-series, shunt-shunt and shunt-series amplifiers (Qualitative Analysis). **Output Stages and Power Amplifiers:** Introduction, Classification of output stages,, Class A output stage, Class B output stage: Transfer Characteristics, Power Dissipation, Power Conversion efficiency, Class AB output stage, Class C tuned Amplifier. **[Text 1: 7.1, 7.2, 7.3, 7.4.1, 7.5.1, 7.6 (7.6.1 to 7.6.3), 13.1, 13.2, 13.3(13.3.1, 13.3.2, 13.3.3, 13.4, 13.7)]**	**L1, L2, L3**
Module -4	
Op-Amp with Negative Feedback and general applications Inverting and Non inverting Amplifiers – Closed Loop voltage gain, Input impedance, Output impedance, Bandwidth with feedback. DC and AC Amplifiers, Summing, Scaling and Averaging Amplifiers, Instrumentation amplifier, Comparators, Zero Crossing Detector, Schmitt trigger. **[Text 2: 3.3(3.3.1 to 3.3.6), 3.4(3.4.1 to 3.4.5) 6.2, 6.5, 6.6 (6.6.1), 8.2, 8.3, 8.4]**	**L1,L2, L3**
Module -5	
Op-Amp Circuits: DAC - Weighted resistor and R-2R ladder, ADC-Successive approximation type, Small Signal half wave rectifier, Active Filters, First and second order low-pass and high-pass Butterworth filters, Band-pass filters, Band reject filters. **555 Timer and its applications:** Monostable and Astable Multivibrators. **[Text 2: 8.11(8.11.1a, 8.11.1b), 8.11.2a, 8.12.2, 7.2, 7.3, 7.4, 7.5, 7.6, 7.8, 7.9, 9.4.1, 9.4.1(a), 9.4.3, 9.4.3(a)]**	**L1, L2, L3**
Course Outcomes: At the end of this course students will demonstrate the ability to • Understand the characteristics of BJTs and FETs. • Design and analyze BJT and FET amplifier circuits. • Design sinusoidal and non-sinusoidal oscillators. • Understand the functioning of linear ICs. • Design of Linear IC based 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. Microelectronic Circuits, Theory and Applications, Adel S Sedra, Kenneth C Smith, 6th Edition, Oxford, 2015.ISBN:978-0-19-808913-1
2. Op-Amps and Linear Integrated Circuits, Ramakant A Gayakwad, 4th Edition. Pearson Education, 2000. ISBN: 8120320581

Reference Books:

1. Electronic Devices and Circuit Theory, Robert L Boylestad and Louis Nashelsky, 11th Edition, Pearson Education, 2013, ISBN: 978-93-325-4260-0.
2. Fundamentals of Microelectronics, Behzad Razavi, 2nd Edition, John Weily, 2015, ISBN 978-81-265-7135-2
3. J. Millman &C.C.Halkias—Integrated Electronics, 2nd edition, 2010, TMH. ISBN 0-07-462245-5

CONTROL SYSTEMS
SEMESTER – IV (EC / TC)
[As per Choice Based Credit System (CBCS) scheme]

Course Code	**18EC43**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**3**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (08 Hours per Module)**	**Exam Hours**	**03**

CREDITS – 03

Course objectives: This course will enable students to:

- Understand the basic features, configurations and application of control systems.
- Understand various terminologies and definitions for the control systems.
- Learn how to find a mathematical model of electrical, mechanical and electro- mechanical systems.
- Know how to fin d time response from the transfer function.
- Find the transfer function via Mason s' rule.
- Analyze the stability of a system from the transfer function.

Modules	**RBT Level**
Module – 1	
Introduction to Control Systems: Types of Control Systems, Effect of Feedback System s, Differential equation of Physical Systems – Mechanical Systems, Electrical Systems, Electromechanical systems, Analogous Systems.	**L1, L2, L3**
Module – 2	
Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra and Signal Flow graphs.	**L1, L2, L3**
Module – 3	
Time Response of feedback control systems: Standard test signals, Unit step response of First and Second order Systems. Time response specifications, Time response specifications of second order systems, steady state errors and error constants. Introduction to PI, PD and PID Controllers (excluding design).	**L1, L2, L3**
Module – 4	
Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh stability criterion, Relative stability analysis: more on the Routh stability criterion. Introduction to Root-Locus Techniques, The root locus concepts, Construction of root loci. **Frequency domain analysis and stability:** Correlation between time and frequency response, Bode Plots, Experimental determination of transfer function.	**L1, L2, L3**
Module – 5	

Introduction to Polar Plots, (Inverse Polar Plots excluded) Mathematical preliminaries, Nyquist Stability criterion, (System s with transportation lag excluded) Introduction to lead, lag and lead- lag compensating networks (excluding design). **Introduction to State variable analysis:** Concepts of state, state variable and state models for electrical systems, Solution of state equations.	**L1, L2, L3**

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

- Develop the mathematical model of mechanical and electrical systems.
- Develop transfer function for a given control system using block diagram reduction techniques and signal flow graph method.
- Determine the time domain specification s for first an d second order systems.
- Deter mine the stability of a system in the time domain using Routh-Hurwitz criterion and Root-locus technique.
- Determine the s stability of a system in the frequency domain u sing Nyquist and bode plots.

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:

J. Nagarath an d M. Gopal, " Control System s Engineering", New Age International (P) Limited, Publishers, Fifth edition- 2005,ISBN: 81 - 224 - 2008-7.

Reference Books:

1. "Modern Control Engineering," K. Ogata, Pearson Education Asia/ PHI, 4th Edition, 2002. ISBN 978 - 81 - 203 - 4010 - 7.
2. "Automatic Control Systems", Benjamin C. Kuo, John Wiley India Pvt. Ltd., 8th Edition, 2008.
3. "Feedback and Control System," Joseph J Distefano III et al., Schaum's Outlines, TMH, 2 n d Edition 2007.

ENGINEERING STATISTICS and LINEAR ALGEBRA
SEMESTER – IV (EC/TC)
[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**18EC44**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours per Module)**	**Exam Hours**	**03**

CREDITS – 03

Course Objectives: This course will enable students to:

- Understand and Analyze Single and Multiple Random Variables, and their extension to Random Processes.
- Familiarization with the concept of Vector spaces and orthogonality with a qualitative insight into applications in communications.
- Compute the quantitative parameters for functions of single and Multiple Random Variables and Processes.
- Compute the quantitative parameters for Matrices and Linear Transformations.

Module-1	**RBT Level**
Single Random Variables: Definition of random variables, cumulative distribution function continuous and discrete random variables; probability mass function, probability density functions and properties; Expectations, Characteristic functions, Functions of single Random Variables, Conditioned Random variables. Application exercises to Some special distributions: Uniform, Exponential, Laplace, Gaussian; Binomial, and Poisson distribution. **(Chapter 4 Text 1)**	**L1, L2, L3**
Module -2	
Multiple Random variables: Concept, Two variable CDF and PDF, Two Variable expectations (Correlation, orthogonality, Independent), Two variable transformation, Two Gaussian Random variables, Sum of two independent Random Variables, Sum of IID Random Variables – Central limit Theorem and law of large numbers, Conditional joint Probabilities, Application exercises to Chi-square RV, Student-T RV, Cauchy and Rayleigh RVs. **(Chapter 5 Text 1)**	**L1, L2, L3**
Module-3	
Random Processes: Ensemble, PDF, Independence, Expectations, Stationarity, Correlation Functions (ACF, CCF, Addition, and Multiplication), Ergodic Random Processes, Power Spectral Densities (Wiener Khinchin, Addition and Multiplication of RPs, Cross spectral densities), Linear Systems (output Mean, Cross correlation and Auto correlation of Input and output), Exercises with Noise. **(Chapter 6 Text 1)**	**L1, L2, L3**

Module -4	
Vector Spaces: Vector spaces and Null subspaces, Rank and Row reduced form, Independence, Basis and dimension, Dimensions of the four subspaces, Rank-Nullity Theorem, Linear Transformations **Orthogonality:** Orthogonal Vectors and Subspaces, Projections and Least squares, Orthogonal Bases and Gram- Schmidt Orthogonalization procedure. **(Refer Chapters 2 and 3 Text 2)**	**L1, L2, L3**
Module -5	
Determinants: Properties of Determinants, Permutations and Cofactors. **(Refer Chapter 4, Text 2**) **Eigenvalues and Eigen vectors:** Review of Eigenvalues and Diagonalization of a Matrix, Special Matrices (Positive Definite, Symmetric) and their properties, Singular Value Decomposition. **(Refer Chapter 5, Text 2)**	**L1, L2, L3**

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

- Identify and associate Random Variables and Random Processes in Communication events.
- Analyze and model the Random events in typical communication events to extract quantitative statistical parameters.
- Analyze and model typical signal sets in terms of a basis function set of Amplitude, phase and frequency.
- Demonstrate by way of simulation or emulation the ease of analysis employing basis functions, statistical representation and Eigenvalues.

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. Richard H Williams, "Probability, Statistics and Random Processes for Engineers" Cengage Learning, 1st Edition, 2003, ISBN 13: 978-0-534-36888-3, ISBN 10: 0-534-36888-3.
2. Gilbert Strang, "Linear Algebra and its Applications", Cengage Learning, 4th Edition, 2006, ISBN 97809802327

Reference Books:

1. Hwei P. Hsu, "Theory and Problems of Probability, Random Variables, and Random Processes" Schaums Outline Series, McGraw Hill. ISBN 10: 0-07-030644-3.
2. K. N. HariBhat, K AnithaSheela, JayantGanguly, "Probability Theory and Stochastic Processes for Engineers", Cengage Learning India, 2019, ISBN: Not in book

SIGNALS AND SYSTEMS
SEMESTER – IV (EC/TC)
[As per Choice Based Credit System (CBCS)

Course Code	**18EC45**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours per Module)**	**Exam Hours**	**03**

CREDITS – 03

Course objectives: This course will enable students to:

- Understand the mathematical description of continuous and discrete time signals and systems.
- Analyze the signals in time domain using convolution sum and Integral.
- Classify signals into different categories based on their properties.
- Analyze Linear Time Invariant (LTI) systems in time and transform domains.

Module-1	**RBT Level**
Introduction and Classification of signals: Definition of signal and systems, communication and control system as examples Classification of signals. **Basic Operations on signals**: Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, time shift and time reversal. **Elementary signals/Functions**: Exponential, sinusoidal, step, impulse and ramp functions. Expression of triangular, rectangular and other waveforms in terms of elementary signals.	**L1, L2, L3**
Module -2	
System Classification and properties: Linear-nonlinear, Time variant-invariant, causal-noncausal, static-dynamic, stable-unstable, invertible. **Time domain representation of LTI System:** Impulse response, convolution sum, convolution integral. Computation of convolution sum and convolution integral using graphical method for unit step and unit step, unit step and exponential, exponential and exponential, unit step and rectangular, and rectangular and rectangular.	**L1, L2, L3**
Module-3	
LTI system Properties in terms of impulse response: System interconnection, Memoryless, Causal, Stable, Invertible and Deconvolution, and step response. **Fourier Representation of Periodic Signals**: CTFS properties and basic problems.	**L1, L2, L3**
Module -4	

Fourier Representation of aperiodic Signals: Introduction to Fourier Transform & DTFT, Definition and basic problems. **Properties of Fourier Transform**: Linearity, Time shift, Frequency shift, Scaling, Differentiation and Integration, Convolution and Modulation, Parseval's theorem and problems on properties of Fourier Transform.	**L1, L2, L3**
Module -5	
The Z-Transforms: Z transform, properties of the region of convergence, properties of the Z-transform, Inverse Z-transform, Causality and stability, Transform analysis of LTI systems.	**L1, L2, L3**

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

- Analyze the different types of signals and systems.
- Determine the linearity, causality, time-invariance and stability properties of continuous and discrete time systems.
- Represent continuous and discrete systems in time and frequency domain using different transforms Test whether the system is stable.

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:

Simon Haykins and Barry Van Veen, "Signals and Systems", 2nd Edition, 2008, Wiley India. ISBN 9971-51-239-4.

Reference Books:

1. **Michael Roberts,** "Fundamentals of Signals & Systems", 2nd edition, Tata McGraw-Hill, 2010, ISBN 978-0-07-070221-9.
2. **Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab,** "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002.
3. **H.P Hsu, R. Ranjan,** "Signals and Systems", Scham's outlines, TMH, 2006.
4. **B. P. Lathi,** "Linear Systems and Signals", Oxford University Press, 2005.
5. **Ganesh Rao and SatishTunga,** "Signals and Systems", Pearson/Sanguine.

MICROCONTROLLER
IV Semester (EC/TC)
[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**18EC46**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**03**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (8 Hours per Module)**	**Exam Hours**	**03**

CREDITS – 03

Course objectives: This course will enable students to:

- Understand the difference between a Microprocessor and a Microcontroller and embedded microcontrollers.
- Familiarize the basic architecture of 8051 microcontroller.
- Program 8051microprocessor using Assembly Level Language and C.
- Understand the interrupt system of 8051 and the use of interrupts.
- Understand the operation and use of inbuilt Timers/Counters and Serial port of 8051.
- Interface 8051 to external memory and I/O devices using its I/O ports.

Module-1	**RBT Level**
8051 Microcontroller: Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.	**L1, L2**
Module -2	
8051 Instruction Set: Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples (without loops) to use these instructions.	**L1, L2**
Module-3	
8051 Stack, I/O Port Interfacing and Programming: 8051 Stack, Stack and Subroutine instructions. Assembly language program examples on subroutine and involving loops. Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status.	**L1, L2, L3**
Module -4	

8051 Timers and Serial Port: 8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode-2 on a port pin. 8051 Serial Communication- Basics of Serial Data Communication, RS-232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receive data serially.	**L1, L2, L3**
Module -5	
8051 Interrupts and Interfacing Applications: 8051 Interrupts. 8051 Assembly language programming to generate an external interrupt using a switch, 8051 C programming to generate a square waveform on a port pin using a Timer interrupt. Interfacing 8051 to ADC-0804, DAC, LCD and Stepper motor and their 8051 Assembly language interfacing programming.	**L1, L2, L3**

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

- Explain the difference between Microprocessors & Microcontrollers, Architecture of 8051 Microcontroller, Interfacing of 8051 to external memory and Instruction set of 8051.
- Write 8051 Assembly level programs using 8051 instruction set.
- Explain the Interrupt system, operation of Timers/Counters and Serial port of 8051.
- Write 8051 Assembly language program to generate timings and waveforms using 8051 timers, to send & receive serial data using 8051 serial port and to generate an external interrupt using a switch.
- Write 8051 Assembly language programs to generate square wave on 8051 I/O port pin using interrupt and C Programme to send & receive serial data using 8051 serial port.
- Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051 using 8051 I/O ports.

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. "The 8051 Microcontroller and Embedded Systems – using assembly and C", Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006.
2. "The 8051 Microcontroller", Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.

Reference Books:

1. "The 8051 Microcontroller Based Embedded Systems", Manish K Patel, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.
2. "Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, Pearson Education, 2005.

MICROCONTROLLER LABORATORY

SEMESTER – IV(EC/TC)

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

Laboratory Code	**18ECL47**	**CIE Marks**	**40**
Number of Lecture Hours / Week	**02 Hr Tutorial (Instructions) + 02 Hours Laboratory**	**SEE Marks**	**60**
RBT Levels	**L1, L2, L3**	**Exam Hours**	**03**

CREDITS – 02

Course objectives: This laboratory course enables students to

- Understand the basics of microcontroller and its applications.
- Have in-depth knowledge of 8051 assembly language programming.
- Understand controlling the devices using C programming.
- The concepts of I/O interfacing for developing real time embedded systems.

Laboratory Experiments

I. PROGRAMMING

1. Data Transfer: Block Move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations).
5. Conditional CALL & RETURN.
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX.
7. Programs to generate delay, Programs using serial port and on-Chip timer/counter.

II. INTERFACING

1. Interface a simple toggle switch to 8051 and write an ALP to generate an interrupt which switches on an LED (i) continuously as long as switch is on and (ii) only once for a small time when the switch is turned on.
2. Write a C program to (i) transmit and (ii) to receive a set of characters serially by interfacing 8051 to a terminal.
3. Write ALPs to generate waveforms using ADC interface.
4. Write ALP to interface an LCD display and to display a message on it.
5. Write ALP to interface a Stepper Motor to 8051 to rotate the motor.
6. Write ALP to interface ADC-0804 and convert an analog input connected to it.

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

- Write Assembly language programs in 8051 for solving simple problems that manipulate input data using different instructions of 8051.
- Interface different input and output devices to 8051 and control them using Assembly language programs.
- Interface the serial devices to 8051 and do the serial transfer using C programming.

Conduct of Practical Examination:

- All laboratory experiments are to be included for practical examination.
- 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 15% Marks allotted to the procedure part to be made zero.

ANALOG CIRCUITS LABORATORY
SEMESTER – IV (EC/TC)
[As per Choice Based Credit System (CBCS) scheme]

Laboratory Code	**18ECL48**	**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 configurations and connectivity of BJT and FET Amplifiers and Study of frequency response
- Design and test of analog circuits using OPAMPs
- Understand the feedback configurations of transistor and OPAMP circuits
- Use of circuit simulation for the analysis of electronic circuits.

Laboratory Experiments

PART A : Hardware Experiments

1. Design and setup the Common Source JFET/MOSFET amplifier and plot the frequency response.
2. Design and set up the BJT common emitter voltage amplifier with and without feedback and determine the gain- bandwidth product, input and output impedances.
3. Design and set-up BJT/FET i) Colpitts Oscillator, and ii) Crystal Oscillator
4. Design active second order Butterworth low pass and high pass filters.
5. Design Adder, Integrator and Differentiator circuits using Op-Amp
6. Test a comparator circuit and design a Schmitt trigger for the given UTP and LTP values and obtain the hysteresis.
7. Design 4 bit R – 2R Op-Amp Digital to Analog Converter (i) using 4 bit binary input from toggle switches and (ii) by generating digital inputs using mod-16
8. Design Monostable and Astable Multivibrator using 555 Timer.

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

1. RC Phase shift oscillator and Hartley oscillator
2. Narrow Band-pass Filter and Narrow band-reject filter

3. Precision Half and full wave rectifier

4. Monostable and Astable Multivibrator using 555 Timer.

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

- Design analog circuits using BJT/FETs and evaluate their performance characteristics.
- Design analog circuits using OPAMPs for different applications
- Simulate and analyze analog circuits that usesICs for different electronic applications.

Conduct of Practical Examination:

- All laboratory experiments are to be included for practical examination.
- 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.

ADDITIONAL MATHEMATICS – II

(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	**18MATDIP41**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**2+1 (Tutorial)**	**SEE Marks**	**60**
Total Number of Lecture Hours	**40 (08 Hours per Module)**	**Exam Hours**	**03**

CREDITS – 0

Course objectives: This course will enable students to:

- Provide essential concepts of linear algebra, second & higher order differential equations along with methods to solve them.
- Provide an insight into elementary probability theory and numerical methods.

Modules	**RBT Level**
Module -1	
Linear Algebra: Introduction - rank of matrix by elementary row operations - Echelon form. Consistency of system of linear equations - Gauss elimination method. Eigen values and eigen vectors of a square matrix. Problems.	**L1, L2**
Module -2	
Numerical Methods: Finite differences. Interpolation/extrapolation using Newton's forward and backward difference formulae (Statements only)-problems. Solution of polynomial and transcendental equations – Newton-Raphson and Regula-Falsi methods (only formulae)- Illustrative examples. Numerical integration: Simpson's one third rule and Weddle's rule (without proof) Problems.	**L1, L2, L3**
Module -3	
Higher order ODE's: Linear differential equations of second and higher order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators. [Particular Integral restricted to R(x)= $e^{ax}, \sin ax/\cos ax$ for $f(D)y = R(x)$.]	**L1, L2**
Module -4	
Partial Differential Equations (PDE's): Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only.	**L1,L2**
Module -5	

Probability: Introduction. Sample space and events. Axioms of probability. Addition & multiplication theorems. Conditional probability, Bayes's theorem, problems.	**L1,L2**

Course Outcomes: At the end of this course students will demonstrate the ability to

- Solve systems of linear equations using matrix algebra.
- Apply the knowledge of numerical methods in modelling and solving engineering problems.
- Make use of analytical methods to solve higher order differential equations.
- Classify partial differential equations and solve them by exact methods.
- Apply elementary probability theory and solve related problems.

Question paper pattern:

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

Text Book:

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

Reference Books:

1. Advanced Engineering Mathematics, E. Kreyszig, John Wiley & Sons, 10th Edition, 2015.
2. Engineering Mathematics, N. P. Bali and Manish Goyal, Laxmi Publishers, 7th Edition, 2007.
3. Engineering Mathematics Vol. I, Rohit Khurana, 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	**L1, L2, L3**

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 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.