ಬಿ.ಎಂ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ, ಬೆಂಗಳೂರು

(ಸ್ವಾಯತ್ತ ವಿದ್ಯಾ ಸಂಸ್ಥೆ)

ಬುಲ್ ಟೆಂಪಲ್ ರಸ್ತೆ, ಬೆಂಗಳೂರು – ೫೬೦ ೦೧೯

B.M.S. COLLEGE OF ENGINEERING

(Autonomous college under VTU)

BANGALORE-560019

ELECTRICAL AND ELECTRONICS ENGINEERING

Scheme for

III – VIII Semester

&

Syllabus for III-IV Sem

2019 Onwards

SCHEME OF INSTRUCTION FOR THIRD SEMESTER

Sl No.	Code	Course title	Type	Credits				Hours	Marks		
				L	T	P	Total		CIE	SEE	Total
1	**19MA3BSEM3**	Engineering Mathematics -3	BS	3	1	0	4	5	50	50	100
2	**19ES3CCECA**	Electrical Circuit Analysis	PC	3	1	0	4	5	50	50	100
3	**19 ES3CCAEC**	Analog Electronic Circuits	PC	3	0	1	4	5	50	50	100
4	**19ES3CCDEC**	Digital Electronics Circuits	PC	3	0	1	4	5	50	50	100
5	**19ES3GCFTH**	Field Theory	PC	3	1	0	4	5	50	50	100
6	19EE3PCEEM	Electrical and Electronic Measurements	PC	3	0	1	4	5	50	50	100
7	**19IC3HSCIP**	Constitution of India and Professional Ethics	HS	1	0	0	1	1	50	50	100
8	19EE3NCPYA	Physical activity	NC	-	-	-	-	2	-	-	P/NP
		Total		**19**	**3**	**3**	**25**	**33**	**350**	**350**	**700**

SCHEME OF INSTRUCTION FOR FOURTH SEMESTER

Sl No.	Code	Course title	Type	Credits				Hours	Marks		
				L	T	P	Total		CIE	SEE	Total
1	**19MA4BSEM4**	Engineering Mathematics - 4	BS	3	1	0	4	5	50	50	100
2	**19ES4ESCST**	Control Systems	ES	3	1	0	4	5	50	50	100
3	**19ES4CCLIC**	Linear Integrated Circuits	PC	3	0	1	4	5	50	50	100
4	**19ES4CCMCS**	Microcontrollers	PC	3	0	1	4	5	50	50	100
5	**19ES4CCSAS**	Signals and Systems	PC	3	1	0	4	5	50	50	100
6	**19EE4PCMC1**	Electrical Machines-I	PC	3	0	0	3	3	50	50	100
7	**19IC4HSEVS**	Environmental studies	HS	2	0	0	2	2	50	50	100
8	19EE4NCCLA	Cultural Activity	NC	-	-	-		2	-	-	P/NP
		Total		**20**	**3**	**2**	**25**	**32**	**350**	**350**	**700**

SCHEME OF INSTRUCTION FOR FIFTH SEMESTER

Sl No.	Code		Course Title	Type	Credits				Hours	Marks		
					L	T	P	Total		CIE	SEE	Total
1	19 EE5PCTND		Transmission and Distribution	PC	3	0	0	3	3	50	50	100
2	19EE5PCMC2		Electrical Machines-II	PC	3	0	1	4	5	50	50	100
3	**19 ES5CCDSP**		Digital Signal Processing	PC	3	0	1	4	5	50	50	100
4	19EE5PCPEN		Power Electronics	PC	3	0	1	4	5	50	50	100
5	19EE5PE1 (Program Elective – I)	DS	Digital system design using FPGA	PE	3	0	0	3	3	50	50	100
		CD	C++ & Data Structures *									
		EA	Electrical Energy Conservation and Auditing									
		MB	Elective based on identified MOOCs									
6	19EE5PE2 (Program Elective – II)	ES	Electrical Energy Systems**	PE	3	0	0	3	3	50	50	100
		AM	Applied Mathematics									
		CS	Communication Systems									
		UP	Utilization of Electric Power									
7	**19ES5HSIFE**		Innovation for Entrepreneurship	HS	2	0	0	2	2	50	50	100
8	19EE5PWMP1		Mini Project - I	PW	0	0	2	2	4	50	50	100
9	19EE5NCSSK		Soft Skills	NC	-	-	-	-	2	-	-	P/NP
			Total		**20**	**0**	**5**	**25**	**32**	**450**	**450**	**900**

* This course has an L-T-P of (2-1-0); ** This course has an L-T-P of (2-0-1).

SCHEME OF INSTRUCTION FOR SIXTH SEMESTER

SL No.	Code		Course Title	Type	Credits				Hours	Marks		
					L	T	P	Total		CIE	SEE	Total
1	19EE6PCPS1		Power Systems-I	PC	3	1	0	4	5	50	50	100
2	19EE6PCPSP		Power System Protection	PC	3	0	1	4	5	50	50	100
3	19EE6PCMCT		Modern Control Theory	PC	3	0	0	3	3	50	50	100
4	19EE6HSPMT		Product Management Techniques	HS	2	0	0	2	2	50	50	100
5	19EE6PE3 (Program Elective – III)	ED	Control of Electric Drives	PE	3	0	0	3	3	50	50	100
		VL	Circuit Design using VLSI	PE								
		AI	AI techniques to Power System	PE								
		HV	HV Engineering*	PE								
6	19EE6CE1 (Cluster Elective- I)	WS	Wind and Solar Energy systems	PE	3	0	0	3	3	50	50	100
		IT	IoT and its applications	PE								
7	19EE6OE1 (Open Elective-I)	IA	Industrial Automation	OE	3	0	0	3	3	50	50	100
8	19EE6PWMP2		Mini Project -II	PW	0	0	2	2	4	50	50	100
9	19EE6SRISR		Internship Seminar-I	SR	0	0	1	1	2	50	50	100
9	19EE6NCCSR		Community Service	NC	0	0	0	0	2	00	00	P/NP
			Total		**20**	**1**	**4**	**25**	**34**	**450**	**450**	**900**

* This course has an L-T-P of (2-0-1)

Internship seminar includes presentation of work carried out during internship at the industry / institution/ valued add courses by the industry/institution attended.

SCHEME OF INSTRUCTION FOR SEVENTH SEMESTER

SL. No.	Code		Course title	Type	Credits				Hours	Marks		
					L	T	P	Total		CIE	SEE	Total
1	19IC7BSBFE		Biology for Engineers	BS	2	0	0	2	2	50	50	100
2	19EE7PCPS2		Power Systems-II	PC	3	0	1	4	5	50	50	100
3	19EE7PCSPE		Sustainable Practices in Power Engineering (by industry expert)	PC	1	0	0	1	2	50	50	100
4	19EE7CE2 (Cluster Elective–II)	EM	Engineering materials	PE	3	0	0	3	3	50	50	100
		PQ	Signal Processing of Power Quality disturbances									
5	19EE7OE2 (Open Elective – II)	MS	Electrical Power and Energy Management Systems	OE	3	0	0	3	3	50	50	100
		EV	Electric and Hybrid Vehicles									
6	19EE7PWMPJ		Major Project Work- I	PW	0	0	3	3	6	50	50	100
7	19ES7HSPMF		Project Management and Finance	HS	3	0	0	3	3	50	50	100
8	19EE7NCMMC		Mass media communication	NC	-	-	-	-	2	-	-	P/NP
			Total		**16**	**0**	**3**	**19**	**26**	**350**	**350**	**700**

SCHEME OF INSTRUCTION FOR EIGHTH SEMESTER

SL no.	Code	Course Title	Type	Credits				Hours	Marks		
				L	T	P	Total		CIE	SEE	Total
1	19ES8HSIPL	IPR & Cyber Law	HS	2	0	0	2	2	50	50	100
2	19EE8OE3OR (Open Elective – III)	Operations Research / Micro and Smart Systems	OE	3	0	0	3	3	50	50	100
3	19EE8SRSMR	Internship Seminar-II	SR	0	0	2	2	2	50	50	100
4	19EE8PWMPJ	Major Project II	PW	0	0	9	9	18	50	50	100
5	19EE8NCOLC	Online Courses	NC	-	-	-	-	2	00	00	P/NP
		Total		**7**	**0**	**9**	**16**	**27**	**200**	**200**	**400**

Internship seminar includes presentation of work carried out during internships at the industry / institution/ valued add courses conducted by the industry/institution attended.

Distribution of Credits among various Curricular Components

Sem	HS	BS	ES	PC	PE	OE	PW	ISR	NC	Total Credits
I		9	11						NC1	**20**
II		9	11						NC2	**20**
III	1	4		20					NC3	**25**
IV	2	4	4	15					NC4	**25**
V	2			15	6		2		NC5	**25**
VI	2			11	6	3	2	1	NC6	**25**
VII	3	2		5	3	3	3		NC7	**19**
VIII	2					3	9	2	NC8	**16**
	12	**28**	**26**	**66**	**15**	**9**	**19**			**175**

HS- Humanities and Social Science Course

BS-Basic Science Course

ES-Engineering Science course

PC -Professional Core

PE-Professional Elective

OE-Open Elective

PW-Project Work

ISR-Internship Seminar

NC-Non credit mandatory course

III Semester Syllabus

B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU
DEPARTMENT OF MATHEMATICS

SYLLABUS (2019 - 2020)

THIRD SEMESTER B.E COURSE
(Common to AS/CV/EEE/ECE/EIE/IEM/ME/ML/TCE)

Course Title	**Engineering Mathematics - 3**	**Course Code**	**19MA3BSEM3**
Credits	**04**	**L – T – P**	**3 - 1 - 0**
Contact hours	**48 hours**		

Prerequisites: Basic concepts of Trigonometry, methods of differentiation, methods of integration, solution of ordinary differential equations.

Course Objectives: The purpose of the course is to make the students conversant with concepts of Linear Algebraic systems, Fourier series, Fourier Transforms and develop computational skills using efficient numerical methods for problems arising in science and engineering.

UNIT-1

MATRICES **[9 hours]**

Introduction: Elementary row transformations, Echelon form of a matrix, rank of a matrix by elementary row transformations. Consistency of a system of linear equations and solution. Solution of a system of non-homogenous equations: Gauss elimination method, Gauss-Seidel method, LU decomposition method, eigenvalues and eigenvectors of matrices, reduction of a matrix to diagonal form. **(7L + 2T)**

UNIT-2

FOURIER SERIES **[9 hours]**

Introduction: Dirichlet's conditions, Fourier series of periodic functions of period $2l$, Fourier series of functions having points of discontinuity. Applications: Fourier series of typical waveforms like saw toothed waveform, triangular waveform, square waveform, half-wave rectifier, full wave rectifier and modified saw tooth waveform, exponential Fourier series, practical harmonic analysis. **(7L + 2T)**

UNIT-3

FOURIER TRANSFORMS **[9 hours]**

Infinite Fourier transform: Fourier Sine and Cosine transforms, properties, Inverse transforms. Convolution theorem, Parseval's identities. **(6L + 3T)**

UNIT-4

NUMERICAL METHODS **[10 hours]**

Solution of algebraic and transcendental equations: Newton-Raphson method.

Finite Differences and interpolation: Forward differences, backward differences. Newton- Gregory forward interpolation formula, Newton-Gregory backward interpolation formula, Lagrange's interpolation formula, Lagrange's inverse interpolation. Numerical integration: Simpson's $1/3^{rd}$ rule, Simpson's $3/8^{th}$ rule, Weddle's rule.

Numerical solution of ordinary differential equations: modified Euler's method, Runge-Kutta method of fourth order**.** **(8L + 2T)**

B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19

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DEPARTMENT OF MATHEMATICS

UNIT-5

CALCULUS OF VARIATIONS **[11 hours]**

Variation of a functional, Euler's equation, variational problems.

Applications: Hanging cable problem, Brachistochrone problem.

Z -TRANSFORMS

Definition, Properties, Transforms of standard functions, Inverse transforms. Solution of difference equations using Z- transforms. **(8L + 3T)**

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On completion of the course, student will have the ability to:

Course Code	CO #	COURSE OUTCOME (CO)	PO
19MA3BSEM3	CO 1	Apply Numerical techniques to solve problems arising in engineering.	1
	CO 2	Demonstrate an understanding of Fourier Series, Fourier Transforms and Z- Transforms.	
	CO 3	Apply the concepts of calculus to functionals.	

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, 43rd edition, 2014, Khanna Publishers.
2. Advanced Engineering Mathematics, 4th edition, 2011, Dennis G. Zill and Cullen, Jones and Bartlett India Pvt. Ltd.

Reference Books:

1. Higher Engineering Mathematics, B. V. Ramana, 2007, Tata McGraw Hill.
2. Advanced Engineering Mathematics, Erwin Kreyszig, 10th edition Vol.1 and Vol.2, 2014, Wiley-India.

E books and online course materials:

1. https://ocw.mit.edu/courses/mechanical-engineering/2-993j-introduction-to-numerical-analysis-for-engineering-13-002j-spring-2005/lecture-notes/
2. https://www.pdfdrive.com/calculus-of-variations-e34313748.html

Online Courses and Video Lectures:

1. https://nptel.ac.in/courses/111103021/22 (Fourier series and Transforms, Heat and Wave Equations)
2. https://nptel.ac.in/courses/122104018/2 (Numerical Methods)
3. https://nptel.ac.in/courses/111104025/ (Calculus of variation)

Question Paper Pattern:

1. Five full questions to be answered.
2. To set one question each from units 1, 2, 4 and two questions each from Unit 3 and Unit 5.

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Course Title	ELECTRICAL CIRCUIT ANALYSIS				
Course Code	19ES3CCECA	Credits	4	L-T-P	3:1:0

UNIT-I

Basic Concepts: **10 Hrs**

Practical sources, Source Transformations, Network reduction using Star-Delta transformation, Loop and nodal analysis with linearly dependent and independent sources for DC and AC circuits, coupled circuit, Analysis of networks using concepts of super node, Super mesh.

UNIT-II

Network Topology: **10 Hrs**

Graph of a network, Concept of tree and Co-tree, Incidence matrix, tie-set & cut-set schedules, Formulation of equilibrium equations, Principle of duality.

Resonant Circuits: Series and parallel resonance, frequency response of series and parallel circuits, Q factor, Bandwidth.

UNIT-III

Network Theorems: **10 Hrs**

Superposition, Reciprocity, Millman's, Thevenin's and Norton's theorems; Maximum power transfer theorem.

UNIT-IV

Transient Behavior and Initial Conditions: **10 Hrs**

Behavior of circuit elements under switching condition and their representation, Evaluation of Initial and Final conditions in RL, RC and RLC circuits.

Laplace Transformation & Applications:

Review of Laplace transforms, Waveform Synthesis, Initial and Final value theorems, Step, Ramp and Impulse responses, Convolution theorem, solution of simple R-L, R-C, R-L-C networks for AC and DC excitations using Laplace transforms.

UNIT-V

Two Port Network Parameters and Analysis of Unbalanced three-phase Load **8 Hrs**

Definition of Z, Y, T, h parameters, modeling, relationship between parameters sets. Analysis of unbalanced three-phase Star, Delta load, Displacement neutral voltage, Calculation of real and reactive power.

Choice: Unit-I and Unit-IV

Text books:

1. "Network Analysis", M.E.Vanvalkenburg, PHI/ Pearson Education, 3rd Edition. Reprint 2002.
2. " Network and systems ", Roy Choudhury, 2nd edition, 2006 reprint, New Age International Publications.
3. Theory and Problems of Electric Circuits, Schaum's Series, 2nd Edition McGraw Hill.

Reference books:

1. "Engineering Circuit Analysis", Hayt, Kemmerly and Durbin, TMH 6th 2002.
2. "Network analysis and Synthesis", Franklin F. Kuo, Wiley Edition.
3. "Analysis of Linear Systems", David K. Cheng, Narosa Publishing House, 11th reprint, 2002.
4. "Circuits", Bruce Carlson, Thomson learning, 2000. Reprint 2002.
5. "Network analysis and Synthesis", D. Anand Kumar, PHI Learning, 2019.

E Books:

1. Nptel.ac.in/courses/108105065- Networks signals and systems by Prof T.K. Basu, IIT Kharagpur.
2. Nptel.ac.in/courses/108102042- Circuit Theory by Prof Dutta Roy S.C, IIT Delhi
3. www.electrodiction.com/circuit-theory.

MOOCs:

1. https://swayam.gov.in/nd1_noc19_ee36/preview

Course Title	ANALOG ELECTRONIC CIRCUITS				
Course Code	19ES3CCAEC	Credits	4	L-T-P	3:0:1

UNIT-I **8 Hrs**

Diode applications: - Introduction, load line analysis, Series diode configurations, Parallel and series –parallel configurations, clippers, Clampers.
Bipolar Junction Transistor (BJTs):- DC biasing– Introduction, operating point, voltage divider Bias configuration
BJT AC Analysis:-Introduction, Application in the AC Domain, BJT Transistor Modeling Transistor model, Voltage Divider Bias

UNIT-II **7 Hrs**

BJT Frequency Response :- Introduction, Logarithms, Decibels , Low frequency Response-BJT Amplifier, Miller effect Capacitance, High Frequency response – BJT Amplifier
Feedback concepts: - Feedback connection types- Voltage series, Voltage-shunt, Current Series and Current Shunt Feedback.
Practical feedback Circuits: - Voltage series, Current series feedback and voltage Shunt feedback.

UNIT-III **10 Hrs**

Power Amplifiers:-
Introduction- Definitions and Amplifier Types, Amplifier Efficiency
Series-Fed Class A Amplifier: DC Bias Operation, AC operation, Power Consideration, Efficiency.
Transformer coupled Class A Amplifier: Operation of Amplifier Stage : DC load line, Quiescent operating point, AC load line , Signal Swing and Output AC power.
Class B operation: Class B Amplifier Circuits- Transformer coupled Push- Pull Circuits, Complementary Symmetry Circuits, and Amplifier Distortion. .

UNIT-IV **7 Hrs**

MOSFETS:-
Introduction ,**Device structure and physical operation** Device structure, operation with no gate voltage, creating a channel for current flow, Applying a small VDs, Operation as VDs is increased, Derivation of the id – V_{DS} relationship, The P- Channel MOSFET, Complementary MOS or CMOS, operating the MOS transistor in the sub-threshold region .
Current voltage Characteristics Circuit symbol, id – V_{DS} characteristics, characteristics of the P-Channel MOSFET
MOSFET Circuits at DC The MOSFET as an amplifier and as a switch --- Large – signal operation , Graphical derivation of the transfer characteristic, operation as a switch, operation as a linear amplifier.

Biasing in MOS amplifier circuits---Biasing by fixing V_{GS}, Biasing by fixing V_G and connecting a resistor in the source , Biasing using a drain to gate feedback resistor, biasing using a current source.

UNIT-V **7 Hrs**

Small – signal operation and models of MOSFETs---The DC bias point, the signal current in the drain terminal ,the voltage gain, separating dc analysis and the signal analysis, small signal equivalent circuit models, the trans conductance g_m, the T equivalent circuit model.
Single stage MOS amplifiers---The basic structure, characterizing amplifiers, The CS amplifier, The CS amplifier with a source resistance.
Common gate (CG) Amplifier, The common Drain or source follower Amplifier.
IC Biasing: – **Current sources, current mirror and current steering circuits**---
The basic MOSFET current source, MOS current steering circuits
Current mirror circuit with improved performance --- The Wilson MOS mirror

Choice: Unit-I and Unit-V

Text books:

1. Electronic Devices and Circuit Theory-Robert L.Boylestad and Louis Nashelsky-10th edition (PEARSON EDUCATION)
2. Microelectronic Circuits-Theory and applications by ADEL S. SEDRA and KENNETH C.SMITH FIFTH EDITION (OXFORD INTERNATIONAL STUDENT EDITION

REFERENCE BOOKS:

1. Electronic Devices and Circuits- Millman and Halkias, TMH
2. Electronic Devices and Circuits- David A Bell - PHI 4th edition

E Books:

1. www.pyroelectro.com/edu/analog
2. http://freevideolectures.com/course/3020/circuits-for-Analog-System-Design

MOOCs:

1. https://www.mooc-list.com/course/electronic-systems-and-digital-electronics-uninettuno?static=true
2. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-012-microelectronic-devices-and-circuits-spring-2009/
3. Introductory Analog Electronics Laboratory (Spring 2007) by MIT open courseware Reviews and Ratings

LABORATORY EXPERIMENT LIST

Sl.No	Title of the Experiments
1	Performance analysis of Transistor as a switch
2	Zener diode characteristics and Zener as regulator
3	Diode clipping circuits- Single/Double ended
4	Diode clamping Circuits – Positive clamping/negative clamping
5	Performance analysis BJT as RC coupled amplifier
6	Design and analysis of BJT as RC phase shift oscillator
7	Design and analysis of Crystal Oscillators
8	To obtain the characteristics of MOSFET (using simulation tool/hardware)
9	To study MOSFET as an amplifier (using Multisim/hardware)
10	To study voltage series feedback amplifier using BJT (using simulation tool/hardware)
11	Performance analysis of class – B Power Amplifier
12	Compare the performance of the practical circuit with the corresponding simulation

Course Title	DIGITAL ELECTRONIC CIRCUITS				
Course Code	19ES3CCDEC	Credits	4	L-T-P	3:0:1

UNIT I **7 Hrs**

Introduction: Review of Boolean algebra, logic gates.
Simplification of Boolean functions: Three Variable, Four Variable and Five Variable K – Maps, The Tabulation Method, Design with Basic gates, NAND gates and NOR gates

UNIT II **8 Hrs**

Combinational Logic Circuits: Introduction, Parallel Adders (Carry Look Ahead Adder and Ripple carry adder), Decimal Adder, Code conversion, Magnitude Comparator, Decoders, Multiplexers, Read Only memories (ROM), Programmable Logic Arrays (PLAs).

UNIT III **7 Hrs**

Sequential Logic Circuits:
The Basic Flip-flop circuit, Clocked Flip-flops, Triggering of Flip-flops: Master Slave Flip-Flops, Edge Triggered Flip Flops, Characteristic Equations, Conversion of flip-flops, Shift Registers, Ripple Counters, Synchronous Counters

UNIT IV **7 Hrs**

Sequential systems:
Analysis of Clocked Sequential circuits, State Reduction and Assignment, Design Procedure, Design with State Equations, Sequence detector

UNIT V **7 Hrs**

Logic Families: Characteristic of Digital ICs, Transistor – Transistor Logic, Complementary MOS (CMOS) Logic, Comparison of TTL and CMOS families.

Choice: Unit-II and Unit-III

TEXT BOOKS:

1. Digital Logic and Computer Design- M. Morris Mano, Prentice Hall – Pearson Education
2. Digital Principles and Design- Donald Givone, Tata Mc Graw Hill

REFERENCE BOOKS:

1. Fundamental of Logic Design- Charles Roth Jr., Thomas Learning
2. Digital Logic Applications and principles- John Yarbrough, Pearson Education

E-Books:

1. http://www.panstanford.com/pdf/9789814364591fm.pdf
2. https://easyengineering.net/digital-logic-and-computer-design-by-morris-mano/
3. https://www.sciencedirect.com/book/9780750645829/digital-logic-design
4. https://easyengineering.net/fundamentals-of-digital-circuits-by-anand-kumar/

Moocs:

1. https://nptel.ac.in/courses/108105113/
2. https://nptel.ac.in/courses/106105185/

Laboratory Experiment List

	Title of the Experiment
1	Applications of IC 7483 (Adders, Subtractors and Comparators) (Unit-II)
2	Multiplexers (using Gates and IC) and their applications (Unit-II)
3	Decoders/DeMultiplexers (using Gates and IC) and their applications (Unit-II)
4	BCD to Decimal decoder using 7-segment display (Unit-II)
5	Verification of MSJK Flip-flop (using Gates and IC 7476) (Unit-III)
6	Asynchronous counters (using ICs 7476,7490,7493) (Unit-III)
7	Synchronous Counters (using ICs 7476, 74190/74192) (Unit-III)
8	Shift registers and their applications (using ICs 7476, 7495) (Unit-III)
9	Verification of few parameters of TTL (Unit-V)
10	Verification of few parameters of CMOS (Unit-V)

Course Title	FIELD THEORY				
Course Code	19ES3GCFTH	Credits	4	L-T-P	3:1:0

UNIT-1 **10 Hrs**

Introduction to electrostatics: Introduction to line integral, surface integral, volume integral of vectors, Coulomb's Law (vector form), Electric Field Intensity(vector form), EFI duetodifferenttypes of charge distributions.
Electric Flux Density (EFD), Gauss' Law, Divergence: Electric Flux Density (EFD), Gauss' Law, Application, Divergence and Divergence Theorem

UNIT-2 **10 Hrs**

Energy and Potential: Energy spent in moving charge, Definition of Potential Difference (PD), PD due to Point Charge and System of Charge, Energy Density
Current and current density: Current and Current Density, Continuity of Current, Conductor, Properties, and Boundary Conditions

UNIT-3 **8 Hrs**

Dielectric: Dielectric materials, boundary conditions,
Poisson's and Laplace's equations: Derivations of Poisson's and Laplace's Equations, solution of Poisson's and Laplace for Single Variables, Capacitance of different configurations using Laplace's equation.

UNIT-4 **10 Hrs**

Steady Magnetic Field:
Biot-Savart Law, Ampere's circuital law, curl, Magnetic Flux, Flux Density, Scalar and Vector Magnetic Potentials, Force on a moving charge, Force on different current element, Inductance and Mutual Inductance Magnetic Boundary Condition.

UNIT-5 **10 Hrs**

Time varying fields and Maxwell's equations: Faraday's Law, Displacement Current, Maxwell's Equations in Point and Integral Form, Uniform plane waves, Wave equations , solution of wave equation, wave propagation through good dielectric, good conductor, skin depth, Poynting Theorem. This course will include lecture from QEEE followed by a suitable QUIZ

Choice: Unit-II and Unit-V

Text books:

1. Engineering Electromagnetics H Hayt, J A Buck, MJaleelAkhtar Tata McGraw-Hill, 8th Edition, 2014.
2. Electromagnetics, Schaum's Outline series Joseph A Ediminister Tata McGraw-Hill, revised second Edition, 2014.

Reference books:

1. Electromagnetics with Applications, John Krauss and Daniel A Fleisch, McGraw-Hill, 5th Edition, 1999.
2. "Field and wave electromagnetic", David K Chary, Pearson Education Asia, Second Edition – 1989, Indian Reprint – 2001
3. Mathew N. O. Sadiku "Elements of Electromagnetics," Oxford University Publication 2014.

Course Title	ELECTRICAL AND ELECTRONIC MEASUREMENTS				
Course Code	19EE3PCEEM	Credits	4	L-T-P	3:0:1

UNIT-I **8 Hrs**

Measurement of Resistance: Wheatstone's bridge, bridge sensitivity, limitations. Kelvin's double bridge, loss of charge method. Problems

Measurement of Inductance and Capacitance: Sources and detectors, Maxwell's LC bridge, Anderson bridge, Desauty's bridge ,Schering bridge, Errors in ac bridges and method of minimization. Problems.

UNIT-II **7 Hrs**

Measurement of Power,Energy and Power factor: Construction and working of dynamometer wattmeter, errors, LPF wattmeters. Measurement of reactive power in three phase circuits using one wattmeter. Block diagram and working of Electronic energy meter. Construction and operation of single phase dynamometer type power factor meter. Problems.

UNIT-III **7 Hrs**

Extension of Instrument Ranges: Construction and theory of current transformers. Expression for ratio error and phase angle error in CT. Turns compensation, Silsbee's method of CT testing. Problems.

DC Potentiometer: Construction and operation of Crompton's dc potentiometer. Applications of dc potentiometer. Problems.

UNIT-IV **7 Hrs**

Electronic and digital Intruments: Advantages of electronic instruments. Electronic multimeters. Block diagram and working of Ramp type DVM, Integrating type DVM, Servo balancing type DVM. Resolution and sensitivity.

Oscilloscopes: Block diagram and working of DSO, Measurement of voltage, frequency and phase using CRO .

UNIT-V **7 Hrs**

Transducers: Classification of transducers, selection factors, Operation of potentiometric transducer.

LVDT, Strain gauges, RTDs, Thermistors, Thermocouples, Piezoelectric transducers. Problems.

Choice: Unit-I and Unit-III

Sl No.	LIST OF THE EXPERIMENTS
1	Measurement of low resistance by Kelvin's double bridge
2	Measurement of medium resistance by Wheatstone's bridge
3	Measurement of inductance of a given coil by Maxwell's LC bridge
4	Measurement of inductance of a given coil by Anderson's bridge
5	Measurement of Capacitance of a given capacitor by Desauty's bridge
6	Measurement of Capacitance of a given capacitor by Schering bridge
7	Measurement of Reactive power in three phase star/delta connected load by one wattmeter method.
8	Calibration of dc ammeter and dc voltmeter using Crompton's dc potentiometer.
9	Measurement of ratio error and phase angle error in current transformer using Silsbee method
10	Plot output voltage versus displacement characteristic of a LVDT
11	Plot output voltage versus temperature characteristic of a Thermocouple.
12	Measurement of voltage, current, frequency and phase difference between two alternating signals using DSO (Demo)

Text books:

1. Electronic instrumentation-H.S.Kalsi, TMH Education Private limited, New –Delhi. 3rd edition,2012
2. A Course in Electrical & Electronic measurements &instrumentation - A.K.Sawhney, Dhanpat Rai and company (Pvt) limited, New –Delhi. Nineteenth revised edition 2011.

Reference books:

1. Modern Electronic instrumentation & measurement Techniques-William.D. Cooper & A.D.Helfrick, Pearson Education. First edition 2015
2. Electronic instrumentation & measurements-David.A.Bell, Oxford University. 3rd edition 2013

E Books:

http://www.free-engineering-books.com/2013/05/electronic-instrumentation-and.html.

Course Title	CONSTITUTION OF INDIA, PROFESSIONAL ETHICS AND HUMAN RIGHTS				
Course Code	19IC3HSCIP/ 19IC4HSCIP	Credits	1	L-T-P	1:0:0

UNIT-1

Introduction to Indian Constitution **3 Hrs**

Historical Background of the Indian Constitution. Framing of the Indian constitution: Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India, Fundamental Rights and its limitations. Fundamental Duties and their significance. Directive Principles of State Policy: Importance and its relevance. Case Studies

UNIT -2

Union Executive and State Executive **2 Hrs**

The Union Executive – The President and The Vice President, The Prime Minister and the Council of Ministers. The Union Parliament – Lok Sabha & Rajya Sabha. The Supreme Court of India.
State Executive – The Governors, The Chief Ministers and The Council of Ministers. The State Legislature – Legislative Assembly and Legislative Council. State High Courts.

UNIT -3

Election Commission of India, Amendments and Emergency Provisions **2 Hrs**

Election Commission of India – Powers & Functions – Electoral Process in India. Methods of Constitutional Amendments and their Limitations. Important Constitutional Amendments – 42nd, 44th, 61st,74th, 76th, 77th, 86th and 91st. Emergency Provisions. Case Studies.

UNIT-4

Special Constitutional Provisions/ Local Administration/ Human Rights **3 Hrs**

Special Constitutional Provisions for Schedule Castes, Schedule Tribes & Other Backward Classes. Women & Children. Case Studies. Local Administration : Powers and functions of Municipalities and Panchyats System. Co – Operative Societies and Constitutional and Non-constitutional Bodies. Human Rights/values – Meaning and Definitions, Legislative Specific Themes in Human Rights and Functions/ Roles of National Human Rights Commission of India. Human Rights (Amendment Act)2006.

UNIT-5

Professional Ethics **3 Hrs**

Scope and Aims of Engineering Ethics, Responsibilities of Engineers and impediments to responsibilities. Honesty, Integrity and Reliability; Risks – Safety and Liability in Engineering. Case Studies.

Text Books:

1. "An Introduction to Constitution of India and Professional Ethics" by Merunandan K.B. and B.R. Venkatesh, Meragu Publications, 3rd edition, 2011.
2. "Constitution of India & Professional Ethics & Human Rights" by Phaneesh K. R., Sudha Publications, 10th edition, 2016.

Reference Books:

1. "V.N. Shukla's Constitution of India" by Prof (Dr.) Mahendra Pal Singh (Revised), Eastern Book Company, Edition: 13th Edition, 2017, Reprint 2019.
2. "Ethics in Engineering" by Martin, W. Mike.,Schinzinger, Roland., McGraw-Hill Education; 4th edition (February 6, 2004) .

E-Book:

1. https://books.google.co.in/books/about/Constitution_of_India_and_Professional_E.html?id=VcvuVt-d88QC Constitution of India and Professional Ethics, by G.B. Reddy and Mohd Suhaib, I.K. International Publishing House Pvt. Ltd., 2006.
2. http://www.scribd.com/doc/82372282/Indian-Constitution-M-Raja-Ram-2009#scribd Indian Constitution, by M. Raja Ram, New Age International Pvt. Limited, 2009.

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DEPARTMENT OF MATHEMATICS

SYLLABUS (2019 - 2020)

THIRD SEMESTER B.E COURSE

(Common to All Branches)

Course Title	**Additional Mathematics-I**	**Course Code**	**19MA3IMMAT**
Credits	**00**	**L – T – P**	**3 – 1 – 0**
Contact hours	**48 hours (36L+12T)**	**III semester Lateral Entry students**	

Prerequisites: Basic concepts of Trigonometry, Trigonometric formulas, concept of differentiation, concept of integration.

Course Objectives: To provide students with a solid foundation in mathematical fundamentals such as differentiation, differential equations, vectors and orthogonal curvilinear coordinates for different branches of engineering.

UNIT 1

DIFFERENTIAL AND INTEGRAL CALCULUS [9 Hours]

List of standard derivatives including hyperbolic functions, rules of differentiation. Taylor's and Maclaurin's series expansion for functions of single variable. List of standard integrals, integration by parts. Definite integrals – problems. **(7L+2T)**

UNIT 2

POLAR COORDINATES AND PARTIAL DERIVATIVES [10 Hours]

Polar curves: Polar coordinates, angle between radius vector and tangent, angle between two polar curves. Partial differentiation. Total differentiation-Composite and Implicit functions. Jacobians and their properties (without proof) – Problems. **(7L+3T)**

UNIT 3

VECTOR CALCULUS AND ORTHOGONAL CURVILINEAR COORDINATES [10 Hours]

Recapitulation of scalars, vectors and operation on scalars and vectors. Scalar and vector point functions. Del operator, gradient-directional derivative, divergence, curl and Laplacian operator. Vector identities (without proof). Cylindrical and Spherical polar coordinate systems. Expressing a vector point function in cylindrical and spherical systems. Expressions for gradient, divergence, curl and Laplacian in orthogonal curvilinear coordinates. **(7L+3T)**

UNIT 4

FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS [9 Hours]

Introduction to first order differential equations. Linear equation and its solution. Bernoulli's equation and its solution. Exact differential equation and its solution. Orthogonal Trajectories.

(7L+2T)

UNIT 5

SECOND AND HIGHER ORDER ORDINARY DIFFERENTIAL EQUATIONS [10 Hours]

Ordinary differential equations with constant coefficients: Homogeneous differential equations, non-homogeneous differential equations – Particular integral for functions of the type $f(x) = e^{ax}$, $\sin(ax)$, $\cos(ax)$, x^n, method of variation of parameters, Cauchy's and Legendre linear differential equations.

(8L+2T)

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On completion of the course, students will have the ability to:

Course Code	CO #	COURSE OUTCOME (CO)	PO
19MA3IMMAT	CO 1	Understand the basic concepts of differentiation and integration.	1
	CO 2	Apply the concepts of polar curves and multivariate calculus.	
	CO 3	Apply analytical techniques to compute solutions of first and higher order ordinary differential equations.	
	CO 4	Apply techniques of vector calculus to engineering problems.	
	CO 5	Comprehend the generalization of vector calculus in curvilinear coordinate system.	

Text Book:

1. Higher Engineering Mathematics, B. S. Grewal, 43rd edition, 2014, Khanna Publishers
2. Advanced Engineering Mathematics, 4th edition, 2011, by Dennis G. Zill and Cullen, Jones and Bartlett India Pvt. Ltd.

Reference Book:

1. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Precise Textbook series, Vol. 1 and Vol. 2, 10th edition, 2014, Wiley- India.
2. Higher Engineering Mathematics, B. V. Ramana, 2007, Tata McGraw Hill.

E books and online course materials:

1. Engineering Mathematics, K. A. Stroud, Dexter J. Booth, Industrial Press, 2001
2. http://books.google.co.in/books/about/Engineering_Mathematics.html?id=FZncL-xB8dEC&redir_esc=y.
3. Advanced Engineering Mathematics, P. V. O'Neil, 5th Indian reprint, 2009, Cengage learning India Pvt. Ltd.
4. http://ocw.mit.edu/courses/mathematics/ (online course material)

Online Courses:

1. https:// www.khanacademy.org/Math
2. https:// www.class-central.com/subject/math (MOOCS)

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IV Semester Syllabus

Course Title	CONTROL SYSTEMS				
Course Code	19ES4ESCST	Credits		L-T-P	3:1:0

UNIT-1 **10 Hrs**

Introduction: Examples of Control Systems, open loop vs Closed loop Systems, Mathematical Modeling of Linear Systems: Transfer functions, Mechanical Systems, Analogous Systems, Block diagram, Signal Flow graph, Transfer Functions of Lag & Lead Compensators.

UNIT-2 **10 Hrs**

Controllers & Time response analysis:
Step response of first order, second order systems, response specification, steady state error and error constants. Effect of PI, PD and PID controllers on the time response of the system.

UNIT-3 **10 Hrs**

Stability Analysis:
Concept of stability, R H criterion, applications of R H criterion with limitations.
Root locus technique:
Introduction to root locus concepts, Construction rules, Analysis of stability by root locus plot

UNIT-4 **8 Hrs**

Frequency response Analysis:
Nyquist plot, Polar plots, Stability Analysis using Nyquist criterion, Bode plots, GM and PM, Relative stability, and Frequency domain specification.

UNIT-5 **10 Hrs**

State Variable Analysis:
Concept of state variables, physical variable model, phase variable model, canonical model, obtaining transfer function from state model, eigen values, solution of state equations, concept of controllability and observability.

Choice: Unit-I and Unit-III

Text books:
1. Control Engineering by Nagrath & Gopal, New Age International Publishers
2. Engineering control systems - Norman S. Nise, John WILEY & sons , fifth Edition

Reference books:
1. Modern control Engineering-Ogata, Prentice Hall
2. Automatic Control Systems- B.C Kuo, John Wiley and Sons

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DEPARTMENT OF MATHEMATICS

SYLLABUS (2019 - 2020)

FOURTH SEMESTER B.E COURSE
(Common to AS/CV/EEE/ECE/EIE/ML/TCE)

Course Title	**Engineering Mathematics - 4**	**Course Code**	**19MA4BSEM4**
Credits	**04**	**L – T – P**	**3 -1- 0**
Contact hours	**48 hours**		

Prerequisites: Complex numbers, multivariate calculus and basic concepts of Statistics and Probability.

Course Objectives: To prepare students with adequate knowledge in Probability and Statistics, Complex Analysis and develop computational skills using efficient numerical methods for problems in science and engineering.

UNIT-1

STATISTICS AND PROBABILITY **[10 hours]**

Curve fitting – Principle of least squares, fitting a straight line, fitting of a parabola, fitting of exponential curve of the form $y = ab^x$. Correlation and regression. Probability distributions: Discrete distribution - Poisson distribution. Continuous distribution- Normal distribution.

(8L + 2T)

UNIT-2

JOINT PROBABILITY AND MARKOV CHAIN **[9 hours]**

Joint Probability Distributions:

Discrete random variables, Mathematical expectations, Covariance and Correlation.

Markov Chain:

Markov Chain, Probability vectors, stochastic matrices, fixed point vector, regular stochastic matrices. Higher transition probabilities, stationary distribution of regular Markov chain.

(7L + 2T)

UNIT-3

NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS **[9 hours]**

Finite-Difference formulas to partial derivatives.

Applications: Solution of one-dimensional heat equation using 2-level formula and Schmidt explicit formula and Crank-Nicolson two-level implicit formula. Solution of one-dimensional wave equation using explicit three level formula and implicit scheme. **(7L + 2T)**

UNIT-4

COMPLEX ANALYSIS – 1 **[10 hours]**

Functions of a complex variable, limits, continuity and differentiability of a complex valued function, Analytic functions, properties of analytic functions, Cauchy-Riemann equations in Cartesian and polar form, construction of analytic functions by Milne-Thomson method.

Conformal mapping: $w = z^2$ and $w = z + \frac{a^2}{z}\left(z \neq 0\right)$. Bilinear transformations. **(7L + 3T)**

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UNIT-5

COMPLEX ANALYSIS - 2 **[10 hours]**

Complex integration: Line integral, Problems on line integral, Cauchy's theorem, Cauchy's integral formula.

Complex series: Taylor's, Maclaurin's and Laurent's series (without proof)-examples.

Zeros, Poles and Residues, Cauchy's residue theorem (without proof)-examples. **(7L + 3T)**

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On completion of the course, student will have the ability to:

Course Code	CO #	COURSE OUTCOMES (CO)	PO
19MA4BSEM4	CO 1	Demonstrate an understanding of concepts of statistical analysis and probability distributions.	1
	CO 2	Apply Numerical techniques to solve partial differential equations arising in engineering.	
	CO 3	Demonstrate an understanding of analytic functions and their application to evaluate integrals.	

Text Books:

1. Numerical Methods for Engineering, R. P. Kanale and S. C. Chapra, 6th edition, McGraw Hill, Publishers.
2. Higher Engineering Mathematics, B. V. Ramana, 2007, Tata McGraw Hill.

Reference Books:

1. Advanced Modern Engineering Mathematics, Glyn James, 3rd edition, 2004, Pearson Education.
2. Higher Engineering Mathematics, B. S. Grewal, 43rd edition, 2013, Khanna Publishers.

E books and online course materials:

1. https://www.coursera.org/learn/basic-statistics
2. http://wiki.stat.ucla.edu/socr/index.php/Probability_and_statistics_EBook
3. https://ocw.mit.edu/courses/mathematics/18-112-functions-of-a-complex-variable-fall-2008/lecture-notes/
4. https://www.math.ubc.ca/~peirce/M257_316_2012_Lecture_8.pdf

Online Courses and Video Lectures:

1. https://nptel.ac.in/courses/111105090/ (Probability & statistics-Joint distribution, testing of hypothesis)
2. https://nptel.ac.in/courses/111103070/ (Complex Analysis - Analytic functions, Mobius transformation & Residue theorem)
3. https://nptel.ac.in/courses/111107056/ (Complex Analysis - Complex integration, conformal mapping)

Question Paper Pattern:

1. Five full questions to be answered.
2. To set one question in Units 1, 2, 3 and two questions each in unit 4 and unit 5.

E Books:

1. http://en.wikibooks.org/wiki/Control_Systems
2. http://www.electrical4u.com/control-system-closed-loop-open-loop-control-system/#practical-examples-of-open-loop-control-system
3. http://www.facstaff.bucknell.edu/mastascu/eControlHTML/CourseIndex.html

Moocs:

1. https://swayam.gov.in/explorer
2. https://www.edx.org/course/

Course Title	LINEAR INTEGRATED CIRCUITS				
Course Code	19ES4CCLIC	Credits	4	L-T-P	3:0:1

UNIT-I **7 Hrs**

Operational Amplifier Characteristics:
Introduction, Amplifiers in closed loop configuration, DC Characteristics, AC Characteristics, Frequency compensation.
Operational Amplifier Applications:
Instrumentation Amplifier, V to I and I to V converter,Op-amp circuits using Diodes – Half wave rectifier, Full wave rectifier, peak detector ,Sample and hold circuit.

UNIT-II **7 Hrs**

Comparators and waveform Generators
Introduction, comparator, Regenerative comparator (Schmitt Trigger), Square wave generator (Astable Multivibrator), Monostable Multivibrator, Triangular wave generator. (RC and weinbridge oscillators only)

UNIT-III **7 Hrs**

Voltage Regulators
Introduction, RC Active Filters, First order low pass filter, second order active filter, Higher order low pass filter, High pass active filter, All pass filter-phase shift lead and lag circuit

UNIT-IV **8 Hrs**

D-A and A-D converters
Introduction, Analog and Digital data converter, specifications of D/A and basic DAC techniques-weighed resistor DAC, R-2R ladder DAC,A-D Converters: Specifications of A/D converter,classification of ADCs- The parallel Comparator (Flash)ADC, counter typeADC, Successive Approximation Converter, single slope type ADC and Dual slope type ADC, Sigma – delta ADC

UNIT-V **7 Hrs**

Timers
Phase locked loops:Introduction, Basic principles, phase detector/comparator, voltage controlled oscillator (VCO), PLL in frequency multiplication/Division

Choice: Unit-I and Unit-IV

Text books:
1. Linear Integrated Circuits-2e-S.Salivahanan & V.S.KanchanaBhaaskaran (Tata McGraw - Hill Publication)
2. Linear Integrated circuits- D Roy Choudhury &shail B Jain (New Age Publication)

Reference books:

1. Opamps and Linear ICs-David A.Bell (Prentice-Hall Publications) (New age Publication)
2. Op-Amps and Linear Integrated Circuits-Ramakanth A.Gayakwad,4th ed,PHI

E Books:

1. https://www.analog.com/en/education/education-library/tutorials/analog-electronics.html
2. https://electronicsforu.com/resources/7-free-ebookstutorials-on-op-amp

MOOCs:

1. https://swayam.gov.in/nd1_noc19_ee39/preview – *op amp practical applications: design, simulation and implementation by* ***Dr. Hardik J. Pandya*** , IISc Bangalore
2. Introductory Analog Electronics Laboratory (Spring 2007) by MIT Open Courseware | Reviews and Ratings
3. http://www.pannam.com/blog/free-resources-to-learn-electrical-engineering/

LABORATORY EXPERIMENT LIST

Sl. No.	Experiment Name
1.	Inverting and non-inverting amplifier, voltage follower
2.	Inverting and non-inverting summing Amplifier
3.	Precision half wave and full wave rectifier
4.	Zero crossing detector and Schmitt trigger
5.	Wein bridge Oscillator
6.	First order active low pass filter
7.	First order active high pass filter
8.	IC 723 as low voltage and high voltage regulators
9.	D to A converter
10.	A to D converter
11.	555 as astable multivibrator
12.	555 as monostable multivibrator

Course Title	MICROCONTROLLERS				
Course Code	19ES4CCMCS	Credits	4	L-T-P	3:0:1

UNIT 1 **8 Hrs**

Fundamentals of Microprocessors: Block diagram approach for Microprocessor and Microcontroller architecture, Comparison of 8-bit microcontrollers, 16-bit and 32-bit microcontrollers. Definition of embedded system and its characteristics, Role of microcontrollers in embedded Systems.
Overview of the 8051 family. The 8051 Architecture Internal Block Diagram, ,address, data and control bus, working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Memory architecture-Harvard and Princeton. Data and Program Memory, Timing diagrams and Execution Cycles.

UNIT 2 **8 Hrs**

Instruction Set and Assembly Language Programming: Introduction, Instruction syntax, Data types, Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set, Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Assembly language programs, Subroutine instructions, Bit manipulation instruction.

UNIT 3 **7 Hrs**

Embedded C Programming: C Data Types, Timer and counter programming, Basics of Serial communication, Programming UART for serial communication, Interrupts.

UNIT 4 **6 Hrs**

Memory and I/O Interfacing: Memory and I/O expansion buses, control signals, memory wait states. Interfacing of peripheral devices such as General Purpose I/O, ADC, DAC.

UNIT 5 **7 Hrs**
Applications - Communication Interface: LCD, ADC, Stepper motor interfacing, DC Motor interfacing, Sensor interfacing for control applications.

CHOICE: UNIT 2 and UNIT 3

Lab Experiments

PART A: The experiments here can be implemented on a simulator using KEIL IDE.

1. Assembly Language Programs to
   - (i) Data Transfer Operations
   - (ii) Arithmetic, Logical Operations
   - (iii) Conditional Operations
   - (iv) Bit Manipulations
   - (v) Port Functioning
   - (vi) Delay operations using Timers
2. Embedded 'C' programs for Arithmetic, Logical , Port operations on simulator

PART B: Interfacing of hardware modules to microcontrollers such as

- (i) Stepper motor
- (ii) Key Board
- (iii) LCD
- (iv) ADC, DAC
- (v) Serial Communication
- (vi) Temperature sensor interface for monitoring and control
- (vii) Sensing of humidity and Co2 for control applications

The experiments may be implemented using KEIL IDE with embedded 'c' programming. The application examples may be modified on similar lines as mentioned in PARTB (vi) and (vii)

Text Books:

1. M. A.Mazidi, J. G. Mazidi and R. D. McKinlay, "The8051Microcontroller and Embedded Systems: Using Assembly and C",Pearson Education, 2007.
2. R. S. Gaonkar, ", Microprocessor Architecture: Programming and Applications with the 8085", Penram International Publishing, 1996

References:

1. K. J. Ayala, "8051 Microcontroller", Delmar Cengage Learning,2004.
2. R. Kamal, "Embedded System", McGraw Hill Education,2009.
3. D.A. Patterson and J.H. Hennessy, "Computer Organization and Design: The Hardware/Software interface", Morgan Kaufman Publishers, 2013.
6. D. V. Hall, "Microprocessors & Interfacing", McGraw Hill Higher Education, 1991.

Course Title	SIGNALS AND SYSTEMS				
Course Code	19ES4CCSAS	Credits	4	L-T-P	3:1:0

UNIT-1 **10 Hrs**

INTRODUCTION TO SIGNALS: Definitions of a signal, elementary signals, classification of signals and basic operations on signals. **(8L+2T)**

UNIT-2 **10 Hrs**

INTRODUCTION TO SYSTEMS: Definitions of a system, properties of systems, systems viewed as Interconnections of operations, Differential and difference equation representations and block diagram representations of LTI systems. **(8L+2T)**

UNIT-3 **11 Hrs**

IMPULSE RESPONSE REPRESENTATION OF LTI SYSTEMS:
Introduction to impulse response representation, Convolution Sum and Convolution Integral, relation with system properties, Interconnection of LTI systems (properties of convolution). **(8L+3T)**

UNIT-4 **07 Hrs**

APPLICATION OF FOURIER ANALYSIS: Fourier representation for Four classes of signals, properties of Fourier transform (proof excluded), frequency response of LTI systems, solution of difference and differential equations. **(5L+2T)**

UNIT-5 **10 Hrs**

APPLICATIONS OF Z-TRANSFORMS: Introduction to bilateral and unilateral Z-transforms, Properties (proof excluded), Analysis of LTI Systems: Transfer function and structures for implementing LTI system, Causality and stability, frequency response, and solution of difference equations. **(7L+3T)**

Choice: Unit-I and Unit-III

Text books:

1. Simon Haykin and Barry Van Veen "Signals and Systems", John Wiley & Sons, 2001.Reprint 2002
2. Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, "Signals and Systems" Pearson Education Asia/ PHI, 2nd edition, 1997. Indian Reprint 2002

Reference books:

1. H. P Hsu, R. Ranjan, "Signalsand Systems", Scham's outlines, TMH, 2006
2. B. P.Lathi, "Linear Systems and Signals", Oxford UniversityPress, 2005
3. Ganesh Rao and SatishTunga, "Signals and Systems", Sanguine Technical Publishers, 2004

E Books:

1. NPTEL lecture Video on Signals and Systems by Prof. S.C.Dutta Roy, http://www.satishkashyap.com/2012/04/iit-video-lectures-on-signals-and.html
2. NPTEL lecture Video on Signals and Systems by Prof. T.K. Basu,IIT Kharagpur. http://www.nptel.ac.in/courses/108105065/
3. NPTEL on line Course Modules–IIT Bombay –Signals and Systems http://www.cdeep.iitb.ac.in/nptel/Electrical%20&%20Comm%20Engg/Signals%20and%20System/TOC-M1.html

Course Title	ELECTRICAL MACHINES -I				
Course Code	19EE4PCMC1	Credits	3	L-T-P	3-0-0

UNIT-1 **8 Hrs**

Single Phase Transformers: Resistance and leakage reactance, Practical transformer - vector diagram of practical transformer on load, Lumped parameters, Equivalent Circuit model of a transformer-Approximate and simplified, OC and SC tests- predetermination of Efficiency, Voltage regulation, parameters of equivalent circuit.

Three Phase Transformers – Introduction, Constructional features of three phase transformers, choice between single unit and bank of three single phase transformers, Three phase transformer connections – star-star, star-delta, delta-star, delta-delta, open delta (V-V), Comparative features, Labeling of three phase transformer terminals, Vector groups. Phase conversion- Scott connection, three phases to six phase conversion.**(Qualitative analysis only)**

UNIT-2 **9 Hrs**

Testing and parallel operation of transformers:
Polarity test, Back to Back test, Separation of Eddy current and Hysteresis losses.
Parallel operation of transformers – Necessity of Parallel operation, conditions for parallel operation - single phase and three phase, Load sharing in case of similar and dissimilar transformers.
Auto Transformers: Construction, principle, applications and comparison with two winding transformers (Cu- Saving).
Tap changing transformers: No load and on load tap changing transformers, Three winding transformers, Cooling of transformers.

UNIT-3 **9 Hrs**

Three phase Induction Motor - Principle of operation-slip, frequency of rotor current/EMF, speed of rotor field, rotor EMF, rotor current and power factor. Rotor Torque - Expression for rotor torque, Torque - slip curve, starting torque, Full load torque, pull out torque. Effect of parameter variation on torque speed characteristics (Variation of stator and rotor resistances, stator voltage, frequency).
Losses and power flow in three phase Induction motor- rotor output and motor torque, synchronous watt. Equivalent circuit model - Electrical equivalent of mechanical load, relation between rotor input and rotor cu-loss, Phasor diagram of three phase Induction motor. Comparison of three phases IM and Transformer.
Methods of starting and speed control of three phase Induction motors

UNIT-4 **9 Hrs**

Testing and performance of Three Phase IM - Stator resistance test, no load test, blocked rotor test. Circle diagram – construction and predetermination of performance (efficiency, slip, torque, power factor, and current, at any given load and at maximum conditions), factors affecting performance of three phase Induction motor, cogging and crawling. High torque cage motors – Deep bar cage rotor motor, double cage rotor motor. Applications of three phases

Induction motor, Measurement of slip – Stroboscopic method, Induction Generator-Self Excitation, Doubly fed Induction machines.

UNIT-5 **5 Hrs**

Single Phase Induction Motors
Constructional features double revolving field theory, equivalent circuit, determination of parameters, Split-phase starting methods and applications.

Choice: Unit-I and Unit-III

Text books:

1. Theory and performance of Electrical Machines- J.B. Gupta, S.K. Kataria and sons-New Delhi,2013
2. Electrical Machinery - Dr. P.S. Bhimbra, ,Khanna Publications, 7th Edition, 2007.
3. Principles of Electric Machines and Power Electronics - P.C Sen, John Wiley and Sons,2007.
4. Electric Machinery- A.E. Fizgerald and C. Kingsley, McGraw Hill Education 2013.

Reference books:

1. Electric Machines – Ashfaq Husain, Dhanpat Rai and Co. , Second Edition,2014
2. Performance and Design of Alternating Current Machines- M. G. Say, John Wiley and Sons Publications, 3 rd Edition,2002
3. Alternating current Machines – A S Langsdorf, McGraw Hill Education -1984.

E Books:

1. http://nptel.ac.in/courses/108105017/
2. http://nptel.ac.in/courses/108106072/

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DEPARTMENT OF MATHEMATICS

SYLLABUS (2019 - 2020)

FOURTH SEMESTER B.E COURSE

(Common to All Branches)

Course Title	**Additional Mathematics-II**	**Course Code**	**19MA4IMMAT**
Credits	**00**	**L – T – P**	**3 – 1 – 0**
Contact hours	**48 hours (36L+12T)**	**IV semester Lateral Entry students**	

Prerequisites: Basic concepts of Trigonometry, Trigonometric formulas, concept of differentiation, concept of integration.

Course Objectives: To provide students with a solid foundation in mathematical fundamentals such as Laplace Transforms, Solution of ordinary differential equations using Laplace Transforms, vector integration, computation of area and volume using double and triple integrals respectively.

UNIT 1

LAPLACE TRANSFORMS **[9 Hours]**

Laplace transforms of standard functions. Properties and problems. Laplace Transform of Periodic functions with plotting, unit step function and dirac-delta function. **(7L+2T)**

UNIT 2

INVERSE LAPLACE TRANSFORMS **[10 Hours]**

Inverse Laplace transforms of standard functions. Properties and problems. Solution of ODE-Initial and Boundary value Problems. **(7L+3T)**

UNIT 3

DOUBLE INTEGRALS **[11 Hours]**

Evaluation of double integral. Change of order of integration. Change of variables to polar coordinates. Application: Area. **(8L+3T)**

UNIT 4

TRIPLE INTEGRALS AND IMPROPER INTEGRALS **[9 Hours]**

Evaluation of triple integral. Application: Volume. Beta and Gamma functions-definition, relation between Beta and Gamma functions, properties and problems.

(7L+2T)

UNIT 5

VECTOR INTEGRATION **[9 Hours]**

Line integral, Green's theorem, Stokes' theorem and Gauss divergence theorem.

(7L+2T)

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19

Autonomous Institute, Affiliated to VTU

DEPARTMENT OF MATHEMATICS

On completion of the course, students will have the ability to:

Course Code	CO #	COURSE OUTCOME (CO)	PO
19MA4IMMAT	CO 1	Use Laplace transforms to solve differential equations.	1
	CO 2	Apply multiple integrals of plane figures to compute areas and volume.	
	CO 3	Use Gamma and Beta functions to evaluate integrals.	
	CO 4	Ability to understand the use of integral calculus in scalar and vector fields.	

Text Book:

1. Higher Engineering Mathematics, B. S. Grewal, 43rd edition, 2014, Khanna Publishers.
2. Higher Engineering Mathematics, B. V. Ramana, 2007, Tata McGraw Hill.

Reference Book:

1. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Precise Textbook series, Vol. 1 and Vol. 2, 10th edition, 2014, Wiley- India.
2. Advanced Engineering Mathematics, 4th edition, 2011, by Dennis G. Zill and Cullen, Jones and Bartlett India Pvt. Ltd

E books and online course materials

1. Engineering Mathematics, K. A. Stroud, Dexter J. Booth, Industrial Press, 2001 http://books.google.co.in/books/about/Engineering_Mathematics.html?id=FZncL- xB8dEC&redir_esc=y.
2. Advanced Engineering Mathematics, P. V. O'Neil, 5th Indian reprint, 2009, Cengage learning India Pvt. Ltd.
3. http://ocw.mit.edu/courses/mathematics/ (online course material)

Online Courses:

1. https:// www.khanacademy.org/Math
2. https:// www.class-central.com/subject/math (MOOCS)
3. E-learning: www.vtu.ac.in

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