SEMESTER V

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
EE1U30A	POWER SYSTEMS I	PCC	3	1	0	4	2020

i) PRE-REQUISITE: ES0U10D Basics of Electrical & Electronics Engineering, PH0U10A Engineering Physics A, Basic Mathematics.

ii) COURSE OVERVIEW:

The goal of this course is to expose the students to the fundamental concepts of generation, transmission and distribution of electric power. The course also intends to deliver the basic concepts of power system protection including the different types of relays and circuit breakers.

iii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Describe the different forms of power generation schemes, terminology related to the economics of power generation, the importance of power factor improvement and the methods to do so.	Understand
CO 2	Deduce the inductance and capacitance of single phase and three phase transmission lines and the ABCD parameters of short, medium and long transmission lines.	Apply
CO 3	Deduce the volume of conductor material required for the various types of power transmission schemes.	Apply
CO 4	Illustrate the types of conductors, insulators and cables used for transmission & distribution and evaluate the related parameters like string efficiency, cable grading, etc.	Apply
CO 5	Solve loading problems related to various power distribution systems and compare AC and HVDC transmission schemes.	Apply
CO 6	Explain the importance of power system protection, different types of Circuit Breakers and relays.	Understand

iv) SYLLABUS

Introduction - Generation of Electric Power - Overview of conventional generation schemes, Economics of Generation – Terminology - Power Factor Improvement using capacitors.

Power Transmission - Transmission Line Parameters: Resistance, inductance and capacitance of single phase, two wire and thee phase lines, Modelling of Transmission Lines.

Introduction of Overhead transmission and underground transmission – Volume of conductor material required - Mechanical Characteristics of transmission lines – Insulators, Cables – Corona.

HVDC Transmission – Comparison, Types of DC Links - Power distribution systems – DC and AC distribution - Types.

Basics of power system protection – Circuit Breakers - Protective Relays – Principle and types.

v) (a) TEXT BOOKS

1) B. R. Gupta, *Power System Analysis and Design*, Wheeler Publishers, 7th revised edition, 2005.
2) J. B. Gupta, *A course in Electrical Power*, Kataria and Sons, 2013 edition.
3) C. L. Wadhwa, *Electrical Power System*, New Age International Publishers, 1st edition, 2016.
4) Grainer J.G., Stevenson W.D., *Power System Analysis*, Tata McGraw Hill, 1st edition, 2017.
5) Badri Ram, D. N. Vishwakarma, *Power System Protection and Switchgear*, Tata McGraw Hill, 2nd edition, 1994.

(b) REFERENCES

1) A. Chakrabarti, M. L. Soni, P. V. Gupta, U. S. Bhatnagar, A *text book on Power System Engineering*, Dhanpat Rai and Co., 2016 edition.
2) I. J. Nagarath & D. P. Kothari, *Modern Power System Analysis*, Tata McGraw Hill, 4th edition, 2011.
3) K. R. Padiyar, *FACTS Controllers in Power Transmission and Distribution*, New Age International, New Delhi, 2nd edition, 2016.
4) William D. Stevenson Jr, *Elements of Power System Analysis*, Tata McGraw Hill, 4th edition, 1982.
5) Sunil S. Rao, *Switchgear and Protection*, Khanna Publishers, 2nd edition, 2012.

vi) COURSE PLAN

Module	Contents	No. of hours
I	**Introduction:** Typical layout of Power system Network. **Generation of Electric Power:** Overview of conventional generation schemes-Hydro, Thermal and Nuclear; Nonconventional Sources-Solar and Wind. Economics of Generation: Terminology-Load factor, diversity factor, Load curve; Numerical Problems. Causes of low lagging power factor, Importance of power factor improvement, Power Factor Improvement using capacitors.	**12**
II	**Power Transmission:** Transmission Line Parameters: Resistance, inductance and capacitance of 1-Φ, 2 wire lines-composite conductors. Inductance and capacitance of 3-Φ lines. Symmetrical and unsymmetrical spacing-transposition-double circuit lines-bundled conductors -Numerical Problems. Modelling of Transmission Lines: Classification of lines-short lines-voltage regulation and efficiency-medium lines-nominal T and Π configurations-ABCD constants-Ferranti effect.	**14**
III	**Introduction of Overhead transmission and underground transmission:** Conductors -types of conductors -copper, aluminium and ACSR conductors -Volume of conductor required for various systems of transmission. Mechanical Characteristics of transmission lines –Calculation of sag and tension-supports at equal and unequal heights -effect of wind and ice.	**12**

	Insulators -Different types -Voltage distribution, grading and string efficiency of suspension insulators. Corona –disruptive critical voltage -visual critical voltage -power loss due to corona -Factors affecting corona. Underground Cables -types of cables -insulation resistance -voltage stress -grading of cables.	
IV	**HVDC Transmission:** Comparison between AC & DC Transmission, Power flow equations and control, Types of DC links. **Power distribution systems:** Radial and Ring Main Systems - DC and AC distribution: Types of distributors- bus bar arrangement -Concentrated and Uniform loading - Methods of solving distribution problems.	**10**
V	**Power System Protection:** Nature, causes and consequences of faults - Fault statistics - Need for protection - Essential qualities of protection - Types of protection – Primary and back up protection. **Circuit breakers:** principle of operation - formation of arc - Arc quenching theory - Restriking Voltage - Recovery Voltage, RRRV; Interruption of Capacitive currents and current chopping. Types of Circuit Breakers: Air blast CB – Oil CB – SF6 CB – Vacuum CB –CB ratings. **Protective Relays:** Zones of Protection, Essential Qualities -Classification of Relays - Electro mechanical, Static Relays, Microprocessor Based Relays; Buchholz relay for transformer protection.	**12**
	Total hours	**60**

vii) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	10 marks
CA Exams (2 numbers)	:	25 marks
Assignment/Project/Case study etc.	:	15 marks
Total	:	**50 marks**

viii) MARK DISTRIBUTION

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
EE1U30B	MICROPROCESSORS AND MICROCONTROLLERS	PCC	3	1	0	4	2020

i) PRE-REQUISITE: ES0U10E - Programming in C, EE1U20F - Digital Electronics

ii) COURSE OVERVIEW:

This course is designed to introduce microcontroller assembly language programming. Students will be taught the basic use of an assembly as well as embedded C programming environment to control peripheral devices. Students will also understand the interfacing of various peripheral elements with microcontroller to design an automated system. The course prepares the student with a set of concepts common to many different embedded systems.

iii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Demonstrate the organization of a microprocessor-based system.	Understand
CO 2	Develop skills for writing assembly language and Embedded C program for 8051 microcontroller.	Apply
CO 3	Construct embedded C program for serial port communication and time delay using timers/counters of 8051.	Apply
CO 4	Construct interrupt programming in embedded C and demonstrate interfacing of different peripheral devices with 8051.	Apply
CO 5	Explain the general characteristics of embedded system and also classify the system with its life cycle development.	Understand

iv) SYLLABUS

Introduction to the concepts of microprocessors, microcontrollers, RISC, CISC, Harvard and Von Neumann architectures, Organization of a microprocessor based system, memory decoding and interfacing, Sample Assembly language programmes (ALP) in 8085 microprocessor.

Types of microcontrollers, Applications of microcontrollers, Architecture of Intel 8051 microcontroller, Assembly language Programming and instruction set of 8051, addressing modes, 8051 programming in C.

8051 Timer/Counter programming in embedded C, 8051 serial port programming in embedded C, Introduction of Keil Software to simulate Assembly and embedded C programs.

8051 Interrupt programming in embedded C, Interfacing: LCD, seven segment display, DIP switches, ADC & DAC, **Motor control.**

Overview of Embedded Systems**,** Application domain of embedded systems, Categories of embedded systems, Design and Development life cycle model, Introduction to ARM processors (Basic concepts only).

v) (a) TEXT BOOKS

1) Douglas V. Hall, *Microprocessors and Interfacing*, Tata McGraw Hill, Education Pvt.Ltd, 2012 Edition.
2) Mathur A., *Introduction to Microprocessors*, Tata McGraw Hill, New Delhi, 2015 Edition.
3) Ramesh Gaonkar, *Microprocessor, Architecture, Programming and Applications*, Pen ram, Fifth Edition, 2000.
4) Muhammad Ali Maidu and Janice Gillespie, *The 8051 Microcontroller and Embedded Systems – using assembly and C*, Pearson, Second Edition 2007.
5) Kenneth J. Ayala, *The 8051 Microcontroller*, 3rd Edition, Thomson/Cengage Learning, 2nd Edition 2007.
6) A. K Ray and K. M. Bhurchandani, *Advanced microprocessors and peripherals*, TMH, 2nd edition 2006.
7) Han Way Huang, *Using the MCS-51 family*, Oxford University Press, 2000.
8) *Craig Steiner*, ***Microcontroller: Architecture Assembly***, Publisher: WP Publishers / Microsoft Press, Released: 2007

(b) REFERENCES

6) Ramesh Gaonkar, *Fundamentals of Microcontrollers and Applications in Embedded Systems (with the PIC18 Microcontroller Family)*, January 2010.
7) Manish K Patel, *The 8051 Microcontroller Based Embedded Systems*, McGraw Hill, July 2017, ISBN: 978-93-329-0125-4.
8) Raj Kamal, *Microcontrollers: Architecture, Programming, Interfacing and System Design*, Pearson Education, January 2011.
9) K.Uma Rao & Andhe Pallavi, *The 8051 microcontrollers, architecture and programming and applications,* Pearson, January 2010.
10) Ajay V. Deshmukh, *Microcontrollers and application*, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2005.
11) D. Karuna Sagar**, *Microcontroller*,** *Publisher: Alpha Science International Ltd Released: 2010-12.*

vi) COURSE PLAN

Module	Contents	No. of hours
I	Introduction to the concepts of microprocessors, microcontrollers, RISC, CISC, Harvard and Von Neumann architectures. **Organization of a microprocessor-based system**: features,8085 architecture and its operation, pin configuration and functions, microprocessor-initiated operations and bus organization, tristate bus concept, generation of control signals, de-multiplexing AD0-AD7, flags, memory decoding, interfacing of RAM and EPROM, I/O addressing, I/O mapped I/O and memory mapped I/O schemes, Sample Assembly language programmes (ALP) in 8085 microprocessors.	**12**
II	**Types of microcontrollers:** Overview of the 8051 family, Selection of microcontrollers, Applications of microcontrollers, Architecture of Intel 8051 microcontroller, PSW and Flag Bits, 8051 Register Banks and	**13**

	Stack, Internal Memory Organization of 8051, IO Port Usage in 8051, Types of Special Function Registers and their uses in 8051, Pins of 8051. **Assembly programming of 8051:** Instruction set of 8051, Introduction to 8051 assembly programming, Data types and Assembler directives, 8051 Addressing Modes, simple Assembly programs. **8051 programming in C**: Data types and time delay in 8051C, I/O programming in 8051C, Logic operations in 8051 C, Data conversion program in 8051 C.	
III	**8051 Timer/Counter programming in embedded C:** Programming 8051 timers, Counter programming, Programming timers 0 and 1 in 8051 C. **8051 serial port programming in embedded C:** Basics of serial communication, 8051 connections to RS232, serial port programming in 8051 C. Introduction of **Keil** Software to simulate Assembly and embedded C programs	**13**
IV	**8051 Interrupt programming in embedded C:** 8051 interrupts, Programming timer, external hardware and serial communication interrupt, Interrupt priority in 8051/52, Interrupt programming in C. **Interfacing:** LCD, seven segment display, DIP switches, ADC & DAC. **Motor control:** Relays and opto isolators, stepper motor interfacing, DC motor interfacing and PWM using 8051	**11**
V	**Overview of Embedded Systems -** Application domain of embedded systems, features and characteristics, overview of embedded system architecture; recent trends in embedded systems, Categories of embedded systems-Hard and soft, Design and Development life cycle model - Embedded system design process – Challenges in Embedded system design, Introduction to ARM processors (Basic concepts only).	**11**
	Total hours	**60**

vii) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	10 marks
CA Exams (2 numbers)	:	25 marks
Assignment/Project/Case study etc.	:	15 marks
Total	:	**50 marks**

viii) MARK DISTRIBUTION

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
EE1U30C	SIGNALS AND SYSTEMS	PCC	3	1	0	4	2020

i) **PRE-REQUISITE:** MA0U10A: Linear Algebra and Calculus, MA0U10B: Vector Calculus, Differential Equations and Transforms, MA0U20A: Partial Differential Equation and Complex Analysis.

ii) **COURSE OVERVIEW**: This course aims to impart knowledge about the representation and properties of signals and systems and its applications in engineering and technology.

iii) **COURSE OUTCOMES**

After the completion of the course the student will be able to:

CO 1	Explain the basic operations on signals and systems.	Understand
CO 2	Apply Fourier Series and Fourier Transform concepts for continuous time signals.	Apply
CO 3	Analyze the continuous time systems with Laplace Transform.	Analyze
CO 4	Analyze the discrete time system using Z Transform.	Analyze
CO 5	Apply Fourier Series and Fourier Transform concepts for Discrete time domain.	Apply
CO 6	Describe the concept of stability of continuous time systems and sampled data systems	Understand

iv) **SYLLABUS**

Basics of signals- operation on signals; Classification of systems; Representation of LTI Systems.
Fourier analysis of continuous time signals; Fourier transform- properties; Frequency response of LTI Systems. Laplace transform analysis of systems- causality- stability-time and Frequency responses.
Sampling- signal reconstruction, Z Transform- Region of convergence- properties;
Solution of LTI Systems using Z transform method. Fourier representation of Discrete time systems; Discrete Time Fourier Series- Discrete Time Fourier Transform.

v) (a) **TEXT BOOKS**

a. Haykin S. & Veen B.V., "*Signals & Systems*", John Wiley Publications, 2nd edition, 2007.
b. Oppenheim A.V, Willsky A.S. & Nawab S.H., "*Signals and Systems*", Pearson Publications, 2nd edition, 2015.
c. I J Nagrarth, "*Signals and Systems*", McGraw Hill Education, 2009.
d. P.Ramesh Babu, R. Anandanadarajan, "*Signals and Systems*", SCITECH Publications Pvt. Ltd, 2008.
e. Dr. D. Ganesh Rao, Satish Tunga," *Signals and Systems*", Cengage India Private Limited, 2017.

(b) REFERENCES

1) Bracewell R.N., "*Fourier Transform & Its Applications*", McGraw Hill Education, 1999.
2) Farooq Husain, "*Signals and Systems*", Umesh Publications, 2017.
3) Papoulis A., "*Fourier Integral & Its Applications*", McGraw-Hill Book Company, 1962.

vi) COURSE PLAN

Module	Contents	No. of hours
I	Introduction to Signals and Systems: Classification of signals: Elementary Signals - Basic operations on continuous time and discrete time signals. Concept of system: Classification of systems- Properties of systems- Time invariance- Linearity - Causality – Memory - Stability-Convolution Integral- Impulse response. Representation of LTI systems: Differential equation representations of LTI systems. Basics of Non-linear systems-types and properties. Introduction to random signals and processes (concepts only)	**12**
II	Fourier Analysis and Laplace Transform Analysis: Fourier analysis of continuous time signals: Fourier Series- Harmonic analysis of common signals. Fourier transform: Existence- Properties of Continuous time Fourier transform- Energy spectral density and power spectral density. Concept of Frequency response. Laplace transform analysis of system transfer function: Relation between the transfer function and differential equation- Transfer function of LTI systems - Electrical, translational and rotational mechanical systems - Force voltage, Force current and Torque Voltage analogy.	**12**
III	System Models and Response: Block diagram representation - block diagram reduction Signal flow graph - Mason's gain formula Type and Order of the systems- Characteristic equation Determining the time domain and frequency response from poles and zeros Concepts of Positive real functions and Hurwitz polynomial- Routh stability criterion. Simulation based analysis: Introduction to simulation tools like MATLAB/ SCILAB or equivalent for mathematical and signal operations (Demo/Assignment only)	**12**
IV	Sampled Data Systems and Z-Transform: Sampling Process - Impulse train sampling-sampling theorem - Aliasing effect Zero order and First order hold circuits - Signal reconstruction Discrete convolution and its properties Z Transform: Region of convergence - Properties of Z Transform Inverse ZT: Methods	**12**
V	Analysis of Sampled Data Systems: Difference equation representations of LTI systems - Analysis of difference equation of LTI systems - Z Transfer function - Delay operator and block diagram representation - Direct form, cascade and parallel representations of 2nd order systems Stability of sampled data system: Basic idea on stability- Jury's test- Use of bilinear transformation Discrete Fourier series: Fourier representation of discrete time signals - Discrete Fourier series– properties. Discrete Time Fourier Transform: Properties - Frequency response of simple DT systems.	**12**
	Total hours	**60**

vii) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	10 marks
CA Exams (2 numbers)	:	25 marks
Assignment/Project/Case study etc.	:	15 marks
Total	:	**50 marks**

viii) MARK DISTRIBUTION

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
EE1U30D	SYNCHRONOUS AND INDUCTION MACHINES	PCC	3	1	0	4	2020

i) PRE-REQUISITE: EE1U20D DC Machines and Transformers.

ii) COURSE OVERVIEW:

The goal of this course is to expose the students to the fundamental concepts of synchronous and induction machines including constructional details, principle of operation, performance analysis and applications. It also introduces students to cognitive learning and develops problem solving skills with both theoretical and engineering oriented problems.

iii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Describe the construction, principle of operation and classification of alternators and synchronous motors.	Understand
CO 2	Develop phasor diagrams and equivalent circuit of an alternator and synchronous motor.	Apply
CO 3	Compare different methods for predetermining voltage regulation of alternators.	Analyze
CO 4	Derive synchronizing power, torque and power equations of cylindrical rotor type and salient pole type synchronous machines.	Understand
CO 5	Explain the construction, principle of operation and types of single phase and three phase induction motors.	Understand
CO 6	Illustrate the various techniques of starting, braking and speed control of three phase induction motors.	Understand

iv) SYLLABUS

Alternators - basic principle, constructional features, Armature windings, EMF Equation-phasor diagram. Power Flow Equations - Direct Loading, EMF, MMF and ZPF methods.

Theory of salient pole machine – Blondel's two reaction theory -Analysis of phasor diagram under lagging power factor- slip test. Power Developed -Parallel operation of alternators.

Synchronous motor – construction and principle-torque and power relationship, phasor diagram, losses and efficiency.

Induction Motors–-constructional features-slip ring and cage types. Phasor diagram, power and torque relations, equivalent circuit. Circle diagrams.

Starting, speed control and braking of induction motors-Double cage induction motor – Synchronous induction motor -Single-phase induction motors.

v) (a) TEXT BOOKS

1) Say M G, *The Performance and Design of AC Machines*, CBS Publishers, New Delhi, 3rd edition, 2002.
2) Bimbhra P S, *Electric Machines*, Khanna Publishers, 2nd edition, 2017.

3) D. P. Kothari, I. J. Nagrath, *Electric Machines*, Tata McGraw Hill, 5th edition, 2019.
4) Langsdorf M. N., *Theory of Alternating Current Machinery*, Tata McGraw Hill, 2nd revised edition, 2001.
5) Deshpande M. V., *Electrical Machines*, Prentice Hall India, New Delhi, Eastern Economy Edition, 2011.

(b) REFERENCES

1) Fitzgerald A. E., C. Kingsley and S. Umans, *Electric Machinery*, 6th edition, McGraw Hill, 2003.
2) Charles I. Hubert, *Electric Machines*, Pearson, New Delhi, 2nd edition, 2007.
3) J B Gupta, *Performance of Electrical Machines*, S K Kataria & Sons, 14th edition, 2013.
4) Ashfaq Husain, Haroon Ashfaq, *Electric Machines*, Dhanpat Rai and Co., 3rd edition, 2016.

vi) COURSE PLAN

Module	Contents	No. of hours
I	**Alternators** - basic principle, constructional features, Classification. Armature windings – types- single layer, double layer, full pitched and short pitched windings, Terminology, pitch factor and distribution factor – numerical problems. Effect of pitch factor on harmonics – advantages of short chorded winding, EMF Equation – numerical problems. Harmonics in generated EMF – suppression of harmonics. **Performance of an alternator** – Causes for voltage drop in alternators – armature resistance, armature leakage reactance – armature reaction, synchronous reactance, and synchronous impedance– phasor diagram of a loaded alternator.	**12**
II	Power Flow Equations of a cylindrical rotor type alternator, Rating of Alternators. **Voltage regulation** – Direct Loading, EMF, MMF and ZPF methods – numerical problems. **Theory of salient pole machine** – Blondel's two reaction theory – direct axis and quadrature axis synchronous reactances – Analysis of phasor diagram under lagging power factor- Determination of Xd and Xq by slip test. Power Developed in a salient pole alternator- numerical problems.	**14**

III	**Parallel operation of alternators –** necessity of parallel operation of alternators, methods of synchronisation– dark lamp method and bright lamp method, synchroscope-Synchronising current, power and torque-Numerical Problems. **Synchronous motor –** construction and principle of synchronous motor, methods of starting-Torque and power relationship, phasor diagram, losses and efficiency calculations of cylindrical rotor type motor; P-δ curve of a synchronous machine. Effects of excitation on armature current and power factor- V and Inverted V Curves, Synchronous Condensers.	**10**
IV	**Induction Machines–** Three phase Induction Motors-constructional features-slip ring and cage types. Basic Principle-Concept of Rotating Magnetic Field-Phasor diagram, power & torque relations, equivalent circuit. Circle diagrams – tests on induction motors for determination of equivalent circuit. Cogging, crawling and noise production in cage motors – remedial measures. **Starting and braking** of induction motors. **Speed control-** From stator side- V / f control or frequency control, Changing the number of stator poles, controlling supply voltage, adding rheostat in the stator circuit; From rotor side-Adding external resistance, Cascade control.	**12**
V	**Double cage induction motor –** principle, torque-slip curves. Synchronous induction motor – principle of operation. **Induction generator –** principle of operation, grid connected and self-excited operation, comparison of induction and synchronous machines. **Single-phase induction motor –** double field revolving theory, equivalent circuit, torque-slip curve, types of single phase induction motors – split phase, capacitor start, capacitor start and run types-Applications.	**12**
	Total hours	**60**

vii) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	10 marks
CA Exams (2 numbers)	:	25 marks
Assignment/Project/Case study etc.	:	15 marks
Total	:	**50 marks**

viii) MARK DISTRIBUTION

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
HSOU30B	MANAGEMENT FOR ENGINEERS	HSC	3	0	0	3	2021

i) PRE-REQUISITE: NIL

ii) COURSE OVERVIEW:

Objective of the course is to learn the basic concepts and functions of management and its role in the performance of an organization and to understand various decision-making approaches available for managers to achieve excellence.

iii) COURSE OUTCOMES:

After the completion of the course, the student will be able to:

CO1	Explain the characteristics of management in the contemporary context	Understand
CO2	Summarize the functions of management	Understand
CO3	Infer the decision-making process and productivity analysis	Understand
CO4	Demonstrate project management technique and develop a project schedule	Apply
CO5	Explain the functional areas of management and the concept of entrepreneurship	Understand

iv) SYLLABUS:

Introduction to management theory- Characteristic of Management, System approaches to Management, Task and Responsibilities of a professional Manager.
Management and organization-Management Process, Planning types, Principles of Organization, Organization Structures.
Productivity and decision making- Concept of productivity and its measurement; Decision making process; Decision trees; Models of decision making.
Project management- Network construction, CPM and PERT Networks, Scheduling computations, PERT time estimates, Probability of completion of project.
Functional areas of management- Operations management, Human resources management, Marketing management, Financial management, Entrepreneurship, Business plans, Corporate social responsibility, Patents and Intellectual property rights.

v) a) TEXTBOOKS

1) H. Koontz, and H. Weihrich, Essentials of Management: An International Perspective. 10th ed., McGraw-Hill, 2015
2) P. Kotler, K. L. Keller, A. Koshy, and M. Jha, Marketing Management: A South Asian Perspective. 15th ed., Pearson, 2016.

3) R. D. Hisrich, and M. P. Peters, Entrepreneurship: Strategy, Developing, and Managing a New Enterprise, 11th ed., McGraw-Hill Education, 2020.
4) M. Y. Khan, and P. K. Jain, Financial Management, Tata-McGraw Hill, 2020.

b) REFERENCES

1) R. B. Chase, Ravi Shankar and F. R. Jacobs, Operations and Supply Chain Management, 15th ed. McGraw Hill Education (India), 2018.
2) P C Tripathi and P N Reddy, Principles of management, TMH, 5th edition, 2012.
3) K.Ashwathappa, 'Human Resources and Personnel Management', TMH, 7th edition, 2011.
4) D. J. Sumanth, Productivity Engineering and Management, McGraw-Hill Education, 2019.

vi) COURSE PLAN:

Module	Contents	No. of hours
I	Introduction to management theory, Management Defined, Characteristic of Management, Management as an art-profession, System approaches to Management, Task and Responsibilities of a professional Manager, Levels of Manager and Skill required.	**8**
II	Management Process, Planning types, Mission, Goals, Strategy, Programmes, Procedures, Organising, Principles of Organisation, Delegation, Span of Control, Organisation Structures, Directing, Leadership, Motivation, Controlling.	**8**
III	Concept of productivity and its measurement; Competitiveness; Decision making process; decision making under certainty, risk and uncertainty; Decision trees; Models of decision making.	**9**
IV	Project Management, Network construction, Arrow diagram, Redundancy. CPM and PERT Networks, Scheduling computations, PERT time estimates, Probability of completion of project, Introduction to crashing.	**10**
V	Introduction to functional areas of management, Operations management, Human resources management, Marketing management, Financial management, Entrepreneurship, Business plans, Corporate social responsibility, Patents and Intellectual property rights.	**10**
	Total hours	**45**

vii) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	10 marks
CA Exams (2 numbers)	:	25 marks
Assignment/Project/Case study etc.	:	15 marks
Total	:	**50 marks**

viii) MARK DISTRIBUTION

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
NC0U30A	DISASTER MANAGEMENT	HSC	2	0	0	Nil	2020

i) PRE-REQUISITE: Nil

ii) COURSE OVERVIEW:

The goal of this course is to expose the students to the fundamental concepts of hazards and disaster management. The course details the various phases of disaster risk management and the measures to reduce disaster risks.

iii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Explain the fundamental concepts and terminology related to disaster management cycle	Understand
CO 2	Explain hazard and vulnerability types and disaster risk assessment	Understand
CO 3	Describe the process of risk assessment and appropriate methodologies to assess risk	Understand
CO 4	Explain the core elements and phases of disaster risk management and measures to reduce disaster risks across sector and community	Apply
CO 5	Discuss the factors that determine the nature of disaster response and the various disaster response actions	Understand
CO 6	Explain the legislations and best practices for disaster management and risk reduction at national and international level	Understand

iv) SYLLABUS

Introduction- Systems of Earth, Key concepts and terminology in disaster risk reduction and management

Hazard types, Vulnerability types and their assessment, Disaster risk assessment

Disaster risk management- Phases of disaster risk management, Measures for disaster risk reduction- prevention, mitigation, preparedness, Disaster response, Relief

Participatory stakeholder engagement, Disaster communication, Capacity building

Common disaster types in India, Legislations in India on Disaster Management, National Disaster Management Policy, Institutional arrangements for disaster management in India, The Sendai Framework for Disaster risk reduction.

v) (a) TEXT BOOKS

1) Coppola, D.P., *Introduction to International Disaster Management*, Elsevier Science (B/H), London, 2020.
2) Srivastava, H.N., Gupta, G.D., *Management of Natural Disasters in developing countries*, Daya Publishers, Delhi, 2007.
3) Subramanian, R., *Disaster Management*, Vikas Publishing House, 2018.

4) Sulphey, M.M., Disaster *Management*, PHI Learning, 2016.

(b) REFERENCES

1) NDMA, *National Policy on Disaster Management*, Ministry of Home Affairs, Government of India, 2009.
2) National Disaster Management Division, *Disaster Management in India - A Status Report*, Ministry of Home Affairs, Government of India, New Delhi, 2004.
3) *National Disaster Management Plan*, NDMA, Ministry of Home Affairs, Government of India, 2019.
4) *Disaster Management Training Manual*, UNDP, 2016.
5) United Nations Office for Disaster Risk Reduction, *Sendai Framework for Disaster Risk Reduction 2015-2030*, 2015.

vi) COURSE PLAN

Module	Contents	No. of hours
I	Introduction about various systems of earth, Lithosphere- composition, rocks, soils; Atmosphere- layers, ozone layer, greenhouse effect. Weather, cyclones, atmospheric circulations, Indian monsoon; Hydrosphere- oceans, inland water bodies; Biosphere. Definition and meaning of key terms in Disaster risk reduction and Management – disaster, hazard, exposure, vulnerability, risk, risk assessment, risk mapping, capacity, resilience, disaster risk reduction, disaster risk management, early warning systems, disaster preparedness, disaster prevention, disaster mitigation, disaster response, damage assessment, crisis counselling, needs assessment.	6
II	Various hazard types, hazard mapping; Different types of vulnerability types and their assessment- Physical, social, economic and environmental vulnerability. Core elements of disaster risk assessment. Components of a comprehensive disaster preparedness strategy approaches, procedures. Different disaster response actions.	6
III	Introduction to disaster risk management, core elements of disaster risk management. Phases of disaster risk management, Measures for disaster risk reduction. Measures for disaster prevention, mitigation, and preparedness. Disaster response- objectives, requirements. Disaster response planning; types of responses. Disaster relief, International relief organizations.	7
IV	Participatory stakeholder engagement, Importance of disaster communication, Disaster communication- methods, barriers, Crisis counselling. Introduction to capacity building, Concept- Structural measures, Non-structural measures.	5

	Introduction to Capacity assessment, Capacity assessment-Strengthening, Capacity for reducing risk.	
V	Introduction - common disaster types in India. Common disaster legislations in India on disaster management. National disaster management policy, Institutional arrangements for disaster management in India. The Sendai Framework for Disaster risk reduction and targets-priorities for action, guiding principles.	**6**
	Total hours	**30**

vii) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	10 marks
CA Exams (2 numbers)	:	25 marks
Assignment/Project/Case study etc.	:	15 marks
Total	:	**50 marks**

viii) MARK DISTRIBUTION

Total Marks	CIE	ESE	ESE Duration
150	50	100	3 hours

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
EE1U38A	MICROPROCESSORS AND MICROCONTROLLERS LAB	PCC	0	0	3	2	2020

i) PRE-REQUISITE: ES0U10E -Programming in C.

ii) COURSE OVERVIEW: The main objective of the course is to develop logic and coding skills that have wide scope in automation and various fields of engineering. The course also exposes students to the operation of typical microprocessor (8085) trainer kit. The course will prepare students to be able to solve different problems by developing different programs.

iii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Develop and execute assembly language programs for solving arithmetic and logical problems using microprocessor/microcontroller.	Apply
CO 2	Develop embedded C programming using the instruction set of 8051.	Apply
CO 3	Examine circuits for interfacing processor with various peripheral devices.	Analyze
CO 4	Design a microcontroller-based system with the help of various interfacing devices.	Create

iv) SYLLABUS

8085 Microprocessor Programming

1. Data transfer using different addressing modes and block transfer.
2. Arithmetic operations in binary and BCD: addition, subtraction, multiplication and division

8051 Microcontroller Programming

3. ALP programming for
   (a) Data transfer: Block data movement, exchanging data, sorting, finding largest element in an array.
   (b) Arithmetic operations: Addition, subtraction, multiplication and division. Computation of square and cube of 16-bit numbers.
4. ALP programming for the implementation of counters: HEX up and down counters, BCD up/down counters
5. (a) ALP programming for implementing Boolean and logical instructions: bit manipulation.

(b) ALP programming for implementing conditional call and return instructions: Toggle the bits of port 1 by sending the values 55H and AAH continuously, Factorial of a number

6. ALP programming for Generation of delay
7. C Programs for stepper motor control.
8. C Programs for DC motor direction and speed control using PWM.
9. C Programs for Alphanumerical LCD panel/ keyboard interface.
10. C Programs for ADC interfacing.
11. Demo Experiments using 8085 Microprocessor Programming
    (a) Digital I/O using PPI: square wave generation.
    (b) Interfacing D/A converter- generation of simple waveforms-triangular, ramp etc.
    (c) Interfacing A/D converter.
12. Demo Experiments using 8051 Microcontroller Programming
    ALP programming for implementing code conversion– BCD to ASCII, ASCII to BCD, ASCII to decimal, Decimal to ASCII, Hexadecimal to Decimal and Decimal to Hexadecimal.
13. a) Familiarization of Arduino IDE
    b) LED blinking with different ON/OFF delay timings with i) inbuilt LED ii) externally Interfaced LED
14. Arduino based voltage measurement of 12V solar PV module/ 12V battery and displaying the measured value using I2C LCD display.
15. Arduino based DC current measurement using Hall-effect current sensor displaying the value using I2C LCD module.
16. Demo experiments on Arduino/Raspberry Pi to upload/retrieve temperature and humidity data to thing speak cloud.
17. SIMPLE PROJECT WORK INCLUDING MULTIPLE INTERFACES.

v) REFERENCES

1) Ramesh Gaonkar, Microprocessor Architecture Programming and Applications, Penram International Publishing; Sixth edition, 2014.
2) R Kenneth J. Ayala, *The 8051 Microcontroller*, Cengage learning, 3/e, November 2007.
3) R. Lyla B.Das, *Microprocessors and Microcontrollers*, Pearson Education, India, 2011.
4) R Soumitra Kumar Mandal, *Microprocessors and Microcontrollers Architecture, Programming & Interfacing Using 8085, 8086 and 8051*, McGraw Hill Education (2011).
5) R Nagoorkani, Microprocessors *and Microcontrollers*, 2e, McGraw Hill Education India, 2012.
6) R Muhammed Ali Mazidi, *The 8051 Microcontroller and Embedded Systems*, Pearson Education, 2nd edition, January 2007.
7) R I.Scott Mackenzie, Raphel C.-W Phan, *The 8051 microcontroller*, 4th edition, July 2006.

vi) COURSE PLAN

Experiment No.	List of exercises/experiments	No. of hours
I	8085-Assembly language Programming for Data transfer using different addressing modes and block transfer.	**3**
II	8085-Assembly language Programming for Arithmetic operations in binary and BCD: addition, subtraction, multiplication and division.	**3**
III	8051 ALP programming for Data transfer: Block data movement, exchanging data, sorting, finding largest element in an array.	**3**
IV	8051 ALP programming for Arithmetic operations: Addition, subtraction, multiplication and division. Computation of square and cube of 16-bit numbers.	**3**
V	ALP programming for the implementation of counters: HEX up and down counters, BCD up/down counters. ALP programming for implementing Boolean and logical instructions: bit manipulation.	**3**
VI	ALP programming for implementing conditional call and return instructions: Toggle the bits of port 1 by sending the values 55H and AAH continuously, Factorial of a number. ALP programming for Generation of delay.	**3**
VII	C Programs for stepper motor control. C Programs for DC motor direction and speed control using PWM.	**3**
VII	C Programs for Alphanumerical LCD panel/ keyboard interface.	**3**
IX	C Programs for ADC interfacing.	**3**
X	a) Familiarization of Arduino IDE. b) LED blinking with different ON/OFF delay timings with i) inbuilt LED ii) externally Interfaced LED.	**3**
XI	Arduino based voltage measurement of 12V solar PV module/ 12V battery and displaying the measured value using I2C LCD display.	**3**
XII	Arduino based DC current measurement using Hall-effect current sensor displaying the value using I2C LCD module.	**3**
XIII	Demo Experiments using 8085.	**3**
XIV	Demo Experiments using 8051/Cloud platforms.	**3**
XV	**SIMPLE PROJECT WORK INCLUDING MULTIPLE INTERFACES**	**3**
	Total hours	**45**

vii) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	15 marks
CA Exams (1 number)	:	30 marks
Assignment/Project/Case study etc.	:	30 marks
Total	:	**75 marks**

viii) MARK DISTRIBUTION

Total Marks	CIE	ESE	ESE Duration
150	75	75	3 hours

ix) END SEMESTER EXAMINATION PATTERN

k)	Preliminary work	:	15 marks
l)	Implementing the work/Conducting the experiment	:	20 marks
m)	Performance, result and inference (usage of equipment and troubleshooting):	:	15 marks
n)	Viva voce	:	20 marks
o)	Record	:	5 marks
	Total	**:**	**75 marks**

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
EE1U38B	ELECTRICAL MACHINES LAB II	PCC	0	0	3	2	2020

i) PRE-REQUISITE: EE1U30D Synchronous and Induction Machines.

ii) COURSE OVERVIEW:

Objective of the course is to impart practical knowledge to the students by exposing them to hands on experience of testing Induction Motors and Alternators and to validate the results. The course also intends to prepare the students to Analyze the performance of a given machine by adopting suitable tests.

iii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Perform load tests on single phase and three phase Induction Motors and evaluate their performances.	Apply
CO 2	Perform no load and blocked rotor tests on single phase and three phase Induction Motors to develop equivalent circuit, and evaluate their performances.	Apply
CO 3	Develop the V and Inverted V curves of a Synchronous Induction Motor.	Apply
CO 4	Analyze the various methods to find the regulation of Alternators and suggest the best method.	Apply
CO 5	Develop V and inverted V curves of an Alternator by synchronising it to the bus bars using a suitable method by satisfying the conditions.	Apply
CO 6	Predetermine the regulation of a three-phase salient pole Alternator by performing slip test.	Apply

iv) SYLLABUS

- Familiarization of meters, instruments and safety measures adopted in the laboratory; Study of starters of three phase Induction Motors
- Load Test on a three phase slip sing Induction Motor
- No Load and Blocked Rotor tests on a three phase squirrel cage Induction Motor
- Starting of three phase squirrel cage Induction Motor using Y-Δ Starter
- Performance Characteristics of a pole changing Induction Motor
- No Load and Blocked Rotor Tests on a single phase capacitor start run Induction Motor
- Load Test on a single phase capacitor start Induction Motor
- V and Inverted V curves of a Synchronous Induction Motor
- Regulation of a three phase Alternator by direct loading
- Regulation of a three phase Alternator by EMF and MMF methods
- Regulation of a three phase Alternator by Potier method
- Reactive power control in grid connected Alternators

- Slip Test on a three phase salient pole Alternator
- V/f control of three phase squirrel cage Induction Motor.

v) REFERENCES

1) Bimbra P S, *Electric Machines*, Khanna Publishers, 2nd edition, 2017.
2) D. P. Kothari, I. J. Nagrath, *Electric Machines*, Tata McGraw Hill, 5th edition, 2019.
3) Say M G, *The Performance and Design of AC Machines*, CBS Publishers, New Delhi, 3rd edition, 2002.
4) Langsdorf M. N., *Theory of Alternating Current Machinery*, Tata McGraw Hill, 2nd revised edition, 2001.

vi) COURSE PLAN

Experiment No.	List of exercises/experiments	No. of hours
I	a. Familiarization of meters and instruments used in Electrical Machines Lab b. Study of safety measures to be taken while performing experiments in the lab c. Study of starters of three phase Induction Motors	3
II	**Load test on a three phase slip ring Induction Motor** a. Start the motor using auto transformer or rotor resistance starter and perform load test b. Plot the performance characteristics	3
III	**No load and block rotor test on a three phase squirrel cage Induction Motor** a. Predetermination of performance parameters from circle diagram b. Deduction of equivalent circuit	3
IV	**Starting of a three phase squirrel cage Induction Motor using Y-Δ Starter** a. Start the motor using Y-Δ Starter and perform load test b. Plot the performance characteristics	3
V	**Performance characteristics of a pole changing Induction Motor** a. Run the motor in two different pole configurations (example 4 pole and 8 pole) b. Analyze the performance in the two cases by constructing circle diagrams and compare the results	3
VI	**No Load and Blocked Rotor tests on a single phase capacitor start run Induction Motor** a. Conduct no load and blocked rotor test on the motor b. Predetermine the equivalent circuit	3
VII	**Load Test on a single phase capacitor start Induction Motor** a. Perform load test on the motor b. Plot the performance characteristics of the motor	3

VIII	**V and inverted V curves of a synchronous Induction Motor** Plot the V and inverted V curves of the Synchronous Induction Motor at no load and full load.	**3**
IX	**Regulation of a three phase Alternator by direct loading** a. Determine the regulation of three phase alternator b. Plot the regulation curve	**3**
X	**Regulation of a three phase Alternator by emf and mmf methods** Predetermine the regulation of alternator by emf and mmf methods at 0.8pf lag, upf and 0.8pf lead.	**3**
XI	**Regulation of a three phase Alternator by Potier method** a. Synchronize the alternator by dark lamp method b. Plot ZPF characteristics and determine armature reactance mmf and Potier reactance c. Predetermine the regulation by ZPF method	**3**
XII	**Reactive power control in grid connected Alternators** a. Synchronize the alternator by bright lamp method b. Control the reactive power and plot the V and inverted V curves for generator operation	**3**
XIII	**Slip Test on a three phase salient pole Alternator** a. Determine the direct and quadrature synchronous reactances. b. Predetermine the regulation at 0.8 lagging power factor	**3**
XIV	**V/f control of three phase squirrel cage Induction Motor** Perform speed control of the given three phase induction motor by V/f control	**3**
	Total Hours	**45**

vii) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	15 marks
CA Exams (1 number)	:	30 marks
Assignment/Project/Case study etc.	:	30 marks
Total	:	**75 marks**

viii) MARK DISTRIBUTION

Total Marks	CIE	ESE	ESE Duration
150	75	75	3 hours

ix) END SEMESTER EXAMINATION PATTERN

p)	Preliminary work	:	15 marks
q)	Implementing the work/Conducting the experiment	:	20 marks
r)	Performance, result and inference (usage of equipment and troubleshooting):	:	15 marks
s)	Viva voce	:	20 marks
t)	Record	:	5 marks
	Total	**:**	**75 marks**