As per DVV clarifications the proof document for experiential learning are attached.

The following are the syllabus copy as per Anna university curriculum and relevant experiential learning document

1.3.2

COURSES THAT INCLUDE EXPERIENTIAL LEARNING THROUGH PROJECT WORK/ FIELDWORK / INTERNSHIP DURING

2020-2021

1.3.2 AVERAGE PERCENTAGE OF COURSES THAT INCLUDE EXPERIENTIAL LEARNING THROUGH PROJECT WORK / FIELDWORK / INTERNSHIP DURING 2020-2021

S.No.	Programme offering	Name of the Course	Course Code	Project / Field work/ Internship	Page No.
1	B.E-Electrical and Electronics Engineering	High Voltage Engineering	EE8701	Internship Training	4
2	B.E-Electrical and Electronics Engineering	Protection and Switch Gear	EE8602	Project	10
3	B.E-Electrical and Electronics Engineering	Special Electrical Machines	EE8005	Project	16
4	B.E-Electrical and Electronics Engineering	Power System Operation and Control	EE8702	In-Plant Training	22
5	B.E-Electrical and Electronics Engineering	High Voltage Direct Current Transmission	EE8017	Project	29
6	B.E-Electrical and Electronics Engineering	Electric Energy Generation, Utilization and Conservation	EE8015	Project	35
7	B.E-Electrical and Electronics Engineering	Electrical Machines-I	EE8301	In-Plant Training	41
8	B.E-Electrical and Electronics Engineering	Power Plant Engineering	ME8792	Project	45
9	B.E-Electrical and Electronics Engineering	Electrical machines-II	EE8401	Project	51
10	B.E-Electrical and Electronics Engineering	Transmission and distribution	EE8402	Internship Training	57
11	B.E-Electrical and Electronics Engineering	Linear Integrated Circuits and Applications	EE8451	Project	65
12	B.E-Electrical and Electronics Engineering	Control Systems	IC8451	Project	71
13	B.E-Electrical and Electronics Engineering	Power system Analysis	EE8501	In-Plant Training	77
14	B.E-Electrical and Electronics Engineering	Microprocessors and Microcontrollers	EE8551	Project	86
15	B.E-Electrical and Electronics Engineering	Power Electronics	EE8552	Project	92
16	B.E-Electrical and Electronics Engineering	Digital Signal Processing	EE8591	Internship Training	98
17	B.E-Electrical and Electronics Engineering	Biomedical Instrumentation	EI8073	Project	102
18	B.E-Electrical and Electronics Engineering	Solid State Drives	EE8601	Project	108
19	B.E-Electrical and Electronics Engineering	Embedded Systems	EE8691	Internship Training	114
20	B.E-Electrical and Electronics Engineering	Modern Power Converters	EE8004	Project	120

21	B.E-Electrical and Electronics Engineering	Physics for Electronics Engineering	PH8253	Project	126
22	B.E-Electrical and Electronics Engineering	Basic Civil and Mechanical Engineering	BE8252	Project	132
23	B.E-Electrical and Electronics Engineering	Circuit Theory	EE8251	Project	138
24	B.E-Electrical and Electronics Engineering	Project Work	EE8811	Project	144

ANNA UNIVERSITY CHENNAI CURRICULUM

EE8701 HIGH VOLTAGE ENGINEERING L T P C

3 0 0 3

OBJECTIVES:

- To understand the various types of over voltages in power system and protection methods.
- Generation of over voltages in laboratories.
- Measurement of over voltages.
- Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.
- Testing of power apparatus and insulation coordination.

UNITI OVERVOLTAGES INELECTRICALPOWERSYSTEMS 9

Causes of over voltages and its effects on power system — Lightning, switching surges and temporary over voltages, Corona and its effects — Reflection and Refraction of Travelling waves- Protection against over voltages.

UNITII DIELECTRICBREAKDOWN 9

Properties of Dielectric materials - Gaseous breakdown in uniform and non-uniform fields – Corona discharges — Vacuum breakdown — Conduction and breakdown in pure and commercial liquids, Maintenance of oil Quality — Breakdown mechanisms in solid and composite dielectrics- Applications of insulating materials in electrical equipments.

UNITIII GENERATION OFHIGHVOLTAGESANDHIGHCURRENTS 9

Generation of High DC voltage: Rectifiers, voltage multipliers, vandigraff generator: generation of high impulse voltage: single and multistage Marx circuits – generation of high AC voltages: cascaded transformers, resonant transformer and tesla coil- generation of switching surges — generation of impulse currents - Triggering and control of impulse generators.

UNITIV MEASUREMENTOFHIGHVOLTAGESANDHIGHCURRENTS 9

High Resistance with series ammeter — Dividers, Resistance, Capacitance and Mixed dividers - Peak Voltmeter, Generating Voltmeters - Capacitance Voltage Transformers, Electrostatic Voltmeters — Sphere Gaps - High current shunts- Digital techniques in highvoltage measurement.

UNITV HIGHVOLTAGE TESTING&INSULATIONCOORDINATION 9

High voltage testing of electrical power apparatus as per International and Indian standards - Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers- Insulation Coordination& testing of cables.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to understand Transients in power system.
- Ability to understand Generation and measurement of high voltage.
- Ability to understand High voltage testing.
- Ability to understand various types of over voltages in power system.
- Ability to measure over voltages.
- Ability to test power apparatus and insulation coordination

TEXT BOOKS:

1. S.Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, FifthEdition, 2013.

2. E. Kuffel and W.S. Zaengl, J.Kuffel, 'High voltage Engineering fundamentals', Newnes Second Edition Elsevier , New Delhi, 2005.
3. C.L. Wadhwa, 'High voltage Engineering', New Age International Publishers, ThirdEdition, 2010.

REFERENCES

1. L.L. Alston, 'High Voltage Technology', Oxford University Press, First Indian Edition,2011.
2. Mazen Abdel – Salam, Hussein Anis, Ahdab A-Morshedy, Roshday Radwan, High Voltage Engineering – Theory &Practice, Second Edition Marcel Dekker, Inc., 2010.
3. Subir Ray,' An Introduction to High Voltage Engineering' PHI Learning Private Limited, New Delhi, Second Edition, 2013.

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

Labo Scientific

563,7th Cross Main Road, Srinivasa Nagar, Trichy -620017.
labosientificindia@gmail.com, 8667767992

Date: 06.09.2020

To

The Principal,

NPR College of Engineering & Technology,

Natham.

Sir,

Sub: Permission for internship-reg

Ref: NPRCET/OFF/EEE/INT-01/2020-2021 dated: 02.09.2020.

With reference to your letter we are pleased to grant permission for Ms.KASTHURI M (920819105005), Ms.LAKSHMI PRIYA A (920819105006), Ms.USHADEVI C (920819105015) of second year Electrical and Electronics Engineering of your institution to undergo internship in our concern from 09.09.2020 to 19.09.2020.

With Regards

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

For LABO - SCIENTIFIC

Proprietor

Labo Scientific
563, 7th Cross Main Road, Srinivasa Nagar, Trichy 620017.
labo.scientific@gmail.com, 8667767992

Date: 19.09.2020

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Ms. KASTHURI M (920819105005) of Second year EEE of NPR College of Engineering & Technology, Natham have successfully done the internship in our concern from 09.09.2020 to 19.09.2020.

During this period her behavior are good and hardworking.

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

With Regards

For LABO - SCIENTIFIC

Proprietor

Labo Scientific
563, 7th Cross Main Road, Srinivasa Nagar, Trichy-620017
[redacted], 8667767992

Date: 19.09.2020

TO WHOMSOEVER IT MAY CONCERN

This is to certify that) Ms.LAKSHMI PRIYA A (920819105006) of Second year EEE of NPR College of Engineering & Technology, Natham have successfully done the internship in our concern from 09.09.2020 to 19.09.2020.

During this period her behavior are good and hardworking.

Dr. J.SUNDARARAJAN,
M.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

NPR COLLEGE OF ENGG & TECHNOLOGY NATHAM

With Regards

For LABO - SCIENTIFIC

Proprietor

Labo Scientific
563, 7th Cross Main Road, Srinivasa Nagar, Trichy -620017.
[illegible], 8667767992

Date: 19.09.2020

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Ms.USHADEVI C (920819105015) of Second year EEE of NPR College of Engineering & Technology, Natham have successfully done the internship in our concern from 09.09.2020 to 19.09.2020.

During this period her behavior are good and hardworking.

With Regards

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

For LABO - SCIENTIFIC

Proprietor

EE8602 PROTECTION AND SWITCH GEAR L T P C
3 0 0 3

OBJECTIVES:

- To impart knowledge on the following Topics
- Causes of abnormal operating conditions (faults, lightning and switching surges) of the apparatus and system.
- Characteristics and functions of relays and protection schemes.
- Apparatus protection, static and numerical relays
- Functioning of circuit breaker

UNIT I PROTECTION SCHEMES 9

Principles and need for protective schemes – nature and causes of faults – types of faults – Methods of Grounding - Zones of protection and essential qualities of protection – Protection scheme

UNIT II ELECTROMAGNETIC RELAYS 9

Operating principles of relays - the Universal relay — Torque equation — R-X diagram — Electromagnetic Relays – Over current, Directional, Distance, Differential, Negative sequence and Under frequency relays.

UNIT III APPARATUS PROTECTION 9

Current transformers and Potential transformers and their applications in protection schemes - Protection of transformer, generator, motor, bus bars and transmission line.

UNIT IV STATIC RELAYS AND NUMERICAL PROTECTION 9

Static relays — Phase, Amplitude Comparators — Synthesis of various relays using Static comparators – Block diagram of Numerical relays – Over current protection, transformer differential protection, distant protection of transmission lines.

UNIT V CIRCUIT BREAKERS 9

Physics of arcing phenomenon and arc interruption - DC and AC circuit breaking — re-striking voltage and recovery voltage - rate of rise of recovery voltage - resistance switching - current chopping - interruption of capacitive current - Types of circuit breakers — air blast, air break, oil, SF6, MCBs, MCCBs and vacuum circuit breakers — comparison of different circuit breakers — Rating and selection of Circuit breakers.

TOTAL: 45 PERIODS

OUTCOMES

- Ability to analyze the characteristics and functions of relays and protection schemes.
- Ability to study about the apparatus protection, static and numerical relays.
- Ability to acquire knowledge on functioning of circuit breaker.

TEXT BOOKS:

1. Sunil S.Rao, 'Switchgear and Protection', Khanna Publishers, New Delhi, 2008.
2. B.Rabindranath and N.Chander, 'Power System Protection and Switchgear', New Age International (P) Ltd., First Edition 2011.
3. Arun Ingole, 'Switch Gear and Protection' Pearson Education, 2017.

REFERENCES

1. BadriRam ,B.H. Vishwakarma, 'Power System Protection and Switchgear', New Age InternationalPvt Ltd Publishers, Second Edition 2011.
2. Y.G.Paithankar and S.R.Bhide, 'Fundamentals of power system protection', Second Edition,Prentice Hall of India Pvt. Ltd., New Delhi, 2010.
3. C.L.Wadhwa, 'Electrical Power Systems', 6th Edition, New Age International (P) Ltd., 2010.
4. RavindraP.Singh, 'Switchgear and Power System Protection', PHI Learning Private Ltd., New Delhi, 2009.
5. VK Metha," Principles of Power Systems" S. Chand, 2005.
6. Bhavesh Bhalja, R.P. Maheshwari, Nilesh G. Chotani,'Protection and Switchgear' Oxford University Press, 2011.

NPR COLLEGE OF ENGG. & TECHNOLOGY * NATHAM

Dr. J.SUNDARARAJAN,
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Principal
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Natham, Dindigul (Dt) - 624 401.

SIMULATION OF ENERGY CONSERVATION IN STREET LAMP BY RFID

A MINI PROJECT REPORT

Submitted by

ABUDHAGIR K

HARIHARAN S

MOHAMED FAIZ A

SABARISH R

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

ELECTRICAL AND ELECTRONICS ENGINEERING

NPR COLLEGE OF ENGINEERING AND TECHNOLOGY, NATHAM

ANNA UNIVERSITY::CHENNAI 600 025

APRIL 2020

ANNA UNIVERSITY::CHENNAI 600025

BONAFIDE CERTIFICATE

Certified that this mini project report **"SIMULATION OF ENERGY CONSERVATION IN STREET LAMP BY RFID"** is the bonafide work of **"K.ABUDHAGIR (920817105003), S.HARIHARAN (920817105013), A.MOHAMED FAIZ (920817105016), R.SABARISH (920817105024)"** who carried out the project work under my supervision.

SIGNATURE

Mr.G.ELANGOVAN, M.E., (Ph.D).,

HEAD OF THE DEPARTMENT,
Department of Electrical and
Electronics Engineering,
NPR College of Engineering and
Technology,
Natham-634 401.

SIGNATURE

Mr. SATHYAMOORTHI, M.E., (Ph.D).,

SUPERVISOR,
Assistant Professor,
Department of Electrical and
Electronics Engineering,
NPR College of Engineering and
Technology,
Natham-634 401

Submitted for the Project viva-voce examination held on 28.04.2020

INTERNAL EXAMINER

EXTERNAL EXAMINER

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

ABSTRACT

In this work, the new technology of RDIF (Radio Frequency Identification) has been used and simulated in order to identify vehicles and also 3 significant parameters including the average speed of vehicles at any side of access point, the average time for waiting and the queue length. They have been used based on the data from neural network for making the best decision throughout the process of finding out duration of the cycle and percentage of green time for each of the access point. Implementation of this system is possible in the shortest time and it has a better function in any kind of weather condition, time or place compared to similar systems

COLLEGE OF ENGG. & TECHNOLOGY ★ NPR ★ NATHAM

Dr. J.SUNDARA RAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

CONCLUSION

This project concludes that the electric energy can be saved by means of reading the RFID tags when there is Usage of roads in night time by vehicles and we can conserve the electric energy in the range of KW/hr and in future we can extend this project by setuping solar panel nearby road side to supply power to the street light.

Dr. J.SUNDARARAJAN,
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Principal
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EE8005 SPECIAL ELECTRICAL MACHINES L T P C
3 0 0 3

OBJECTIVES:

- To impart knowledge on the following Topics
- Construction, principle of operation, control and performance of stepping motors.
- Construction, principle of operation, control and performance of switched reluctancemotors.
- Construction, principle of operation, control and performance of permanent magnetbrushless D.C. motors.
- Construction, principle of operation and performance of permanent magnet synchronous motors.
- Construction, principle of operation and performance of other special Machines.

UNIT I STEPPER MOTORS 9

Constructional features –Principle of operation –Types – Torque predictions – Linear Analysis – Characteristics – Drive circuits – Closed loop control – Concept of lead angle - Applications.

UNIT II SWITCHED RELUCTANCE MOTORS (SRM) 9

Constructional features –Principle of operation- Torque prediction–Characteristics Steady state performance prediction – Analytical Method – Power controllers – Control of SRM drive- Sensor less operation of SRM – Applications.

UNIT III PERMANENT MAGNET BRUSHLESS D.C. MOTORS 9

Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis- EMF and Torque equations- Power Converter Circuits and their controllers - Characteristics and control- Applications.

UNIT IV PERMANENT MAGNET SYNCHRONOUS MOTORS (PMSM) 9

Constructional features -Principle of operation – EMF and Torque equations - Sine wave motor with practical windings - Phasor diagram - Power controllers – performance characteristics -Digital controllers – Applications.

UNIT V OTHER SPECIAL MACHINES 9

Constructional features — Principle of operation and Characteristics of Hysteresis motor- Synchronous Reluctance Motor–Linear Induction motor-Repulsion motor- Applications.

TOTAL: 45 PERIODS

OUTCOMES

- Ability to analyze and design controllers for special Electrical Machines.
- Ability to acquire the knowledge on construction and operation of stepper motor.
- Ability to acquire the knowledge on construction and operation of stepper switchedreluctance motors.
- Ability to construction, principle of operation, switched reluctance motors.
- Ability to acquire the knowledge on construction and operation of permanent magnetbrushless D.C. motors.
- Ability to acquire the knowledge on construction and operation of permanent magnet synchronous motors.
- Ability to select a special Machine for a particular application.

TEXT BOOKS:

1. K.Venkataratnam, 'Special Electrical Machines', Universities Press (India) PrivateLimited, 2008.
2. T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon PressLondon, 1984
3. E.G. Janardanan, 'Special electrical machines', PHI learning Private Limited, Delhi,2014.

REFERENCES

1. R.Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001.
2. T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors',Clarendon Press, London, 1988.
3. T.J.E.Miller,'Brushless Permanent-Magnet and Reluctance Motor Drives', Oxford University Press, 1989.
4. R.Srinivasan, 'Special Electrical Machines', Lakshmi Publications, 2013.

NPR COLLEGE OF ENGG. & TECHNOLOGY ★ NATHAM

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ENERGY CONSERVATION IN STREET LAMP BY RFID

A PROJECT REPORT

Submitted by

ABUDHAGIR K

HARIHARAN S

MOHAMED FAIZ A

SABARISH R

in partial fulfillment for the award of the degree

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BACHELOR OF ENGINEERING

IN

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ANNA UNIVERSITY::CHENNAI 600 025

APRIL 2021

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

Dr. J.SUNDARARAJAN,
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Natham, Dindigul (Dt) - 624 401.

ANNA UNIVERSITY::CHENNAI 600025

BONAFIDE CERTIFICATE

Certified that this project report **"ENERGY CONSERVATION IN STREET LAMP BY RFID"** is the bonafide work of **"K.ABUDHAGIR (920817105003), S.HARIHARAN (920817105013), A.MOHAMED FAIZ (920817105016), R.SABARISH (920817105024)"** who carried out the project work under my supervision.

SIGNATURE

Mr.G.ELANGOVAN, M.E., (Ph.D).,

HEAD OF THE DEPARTMENT,
Department of Electrical and
Electronics Engineering,
NPR College of Engineering and
Technology,
Natham-634 401.

SIGNATURE

Mr. SATHYAMOORTHI, M.E., (Ph.D).,

SUPERVISOR,
Assistant Professor,
Department of Electrical and
Electronics Engineering,
NPR College of Engineering and
Technology,
Natham-634 401

Submitted for the Project viva-voce examination held on 23.04.2021

INTERNAL EXAMINER

EXTERNAL EXAMINER

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

Dr. J.SUNDARARAJAN,
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Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

ABSTRACT

In this project, the new technology of RDIF (Radio Frequency Identification) has been used in order to identify vehicles and also 3 significant parameters including the average speed of vehicles at any side of access point, the average time for waiting and the queue length. They have been used based on the data from neural network for making the best decision throughout the process of finding out duration of the cycle and percentage of green time for each of the access point. Implementation of this system is possible in the shortest time and it has a better function in any kind of weather condition, time or place compared to similar systems.

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
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Natham, Dindigul (Dt) - 624 401.

CHAPTER 6

CONCLUSION

6.1 CONCLUSION

This project concludes that the electric energy can be saved by means of reading the RFID tags when there is Usage of roads in night time by vehicles and we can conserve the electric energy in the range of KW/hr and in future we can extend this project by setuping solar panel nearby road side to supply power to the street light.

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
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Natham, Dindigul (Dt) - 624 401.

EE8702 POWER SYSTEM OPERATION AND CONTROL

L T P C
3 0 0 3

OBJECTIVES

To impact knowledge on the following topics

- Significance of power system operation and control.
- Real power-frequency interaction and design of power-frequency controller.
- Reactive power-voltage interaction and the control actions to be implemented for maintaining the voltage profile against varying system load.
- Economic operation of power system.
- SCADA and its application for real time operation and control of power systems

UNIT I PRELIMINARIES ON POWER SYSTEM OPERATION AND CONTROL 9

Power scenario in Indian grid — National and Regional load dispatching centers — requirements of good power system - necessity of voltage and frequency regulation - real power vs frequency and reactive power vs voltage control loops - system load variation, loadcurves and basic concepts of load dispatching - load forecasting - Basics of speed governing mechanisms and modeling - speed load characteristics - regulation of two generators in parallel.

UNIT II REAL POWER - FREQUENCY CONTROL 9

Load Frequency Control (LFC) of single area system-static and dynamic analysis of uncontrolled and controlled cases - LFC of two area system - tie line modeling - block diagram representation of two area system - static and dynamic analysis - tie line with frequency bias control — state variability model - integration of economic dispatch control with LFC.

UNIT III REACTIVE POWER – VOLTAGE CONTROL 9

Generation and absorption of reactive power - basics of reactive power control – Automatic Voltage Regulator (AVR) – brushless AC excitation system – block diagram representation of AVR loop - static and dynamic analysis — stability compensation — voltage drop in transmission line - methods of reactive power injection - tap changing transformer, SVC (TCR + TSC) and STATCOM for voltage control.

UNIT IV ECONOMIC OPERATION OF POWER SYSTEM 9

Statement of economic dispatch problem - input and output characteristics of thermal plant - incremental cost curve - optimal operation of thermal units without and with transmission losses (no derivation of transmission loss coefficients) - base point and participation factors method - statement of unit commitment (UC) problem - constraints on UC problem - solution of UC problem using priority list — special aspects of short term and long term hydrothermal problems.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 9

Need of computer control of power systems-concept of energy control centers and functions - PMU - system monitoring, data acquisition and controls - System hardware configurations - SCADA and EMS functions - state estimation problem — measurements and errors -weighted least square estimation - various operating states - state transition diagram.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to understand the day-to-day operation of electric power system.
- Ability to analyze the control actions to be implemented on the system to meet theminute-to-minute variation of system demand.
- Ability to understand the significance of power system operation and control.
- Ability to acquire knowledge on real power-frequency interaction.
- Ability to understand the reactive power-voltage interaction.
- Ability to design SCADA and its application for real time operation.

TEXT BOOKS:

1. Olle.I.Elgerd, 'Electric Energy Systems theory - An introduction', McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.
2. Allen. J. Wood and Bruce F. Wollen berg, 'Power Generation, Operation andControl', John Wiley & Sons, Inc., 2016.
3. Abhijit Chakrabarti and Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

REFERENCES

1. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
2. Hadi Saadat, 'Power System Analysis', McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.
3. Kundur P., 'Power System Stability and Control, McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.

N.P.R. COLLEGE OF ENGG & TECHNOLOGY ★ NATHAM

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

SuPerfect
Solutions

Date: 30.09.2020

To

The Principal,

NPR College of Engineering & Technology,

Natham.

Sir,

Sub: Permission for In-Plant Training-reg

Ref: NPRCET/OFF/EEE/IPT-01/2020-2021 dated: 28.09.2020

With reference to your letter we are pleased to grant permission for Mr. ABUDHAGIR K (920817105003), Mr. HARIHARAN S (920817105013), Mr. MOHAMED FAIZ A (920817105016), Mr. SABARISH R (920817105024) of final year Electrical and Electronics Engineering of your institution to undergo In-Plant Training in our concern from 05.10.2020 to 14.10.2020.

With Regards

For SUPERFECT SOLUTIONS;

AUTHORIZED SIGNATORY

SUPERFECT SOLUTIONS SALEM.

SUPERFECT SOLUTIONS

Tel: 9025-655-523, Mail: info@superfectsolutions.com, Web: www.superfectsolutions.com

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

Dr. J.SUNDARARAJAN,
B.E.,M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

SuPerfect Solutions

Date: 14-10-2020

Ref No: SUP/IPT/20810

INDUSTRIAL IN-PLANT TRAINING CERTIFICATE

TO WHOM IT MAY CONCERN

This is to certify that **Mr. ABUDHAGIR K (920817105003)** pursuing his final year EEE at NPR College of Engineering & Technology, Natham, has undergone his In-Plant Training in our concern **from 05.10.2020 to 14.10.2020.**

We appreciate his participation with interest towards the training program.

For SUPERFECT SOLUTIONS,

AUTHORIZED SIGNATORY

SUPERFECT SOLUTIONS SALEM

SUPERFECT SOLUTIONS

Tel: 9025-655-523, **Mail:** info@superfectsolutions.com, **Web**: www.superfectsolutions.com

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

Dr. J.SUNDARARAJAN,
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SuPerfect
Solutions

Date: 14-10-2020

Ref No: SUP/IPT/20810

INDUSTRIAL IN-PLANT TRAINING CERTIFICATE

TO WHOM IT MAY CONCERN

This is to certify that **Mr. HARIHARAN S (920817105013)** pursuing his final year EEE at NPR College of Engineering & Technology, Natham, has undergone his In-Plant Training in our concern **from 05.10.2020 to 14.10.2020.**

We appreciate his participation with interest towards the training program.

For SUPERFECT SOLUTIONS,

AUTHORIZED SIGNATORY

SUPERFECT SOLUTIONS SALEM

SUPERFECT SOLUTIONS

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NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

Dr. J.SUNDARAM M.E., M.Sc., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

SuPerfect
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Date: 14-10-2020

Ref No: SUP/IPT/20810

INDUSTRIAL IN-PLANT TRAINING CERTIFICATE

TO WHOM IT MAY CONCERN

This is to certify that **Mr. MOHAMED FAIZ A (920817105016)** pursuing his final year EEE at NPR College of Engineering & Technology, Natham, has undergone his In-Plant Training in our concern **from 05.10.2020 to 14.10.2020.**

We appreciate his participation with interest towards the training program.

For SUPERFECT SOLUTIONS,

SUPERFECT SOLUTIONS SALEM

AUTHORIZED SIGNATORY

SUPERFECT SOLUTIONS

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NPR COLLEGE OF ENGG & TECHNOLOGY NATHAM

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SuPerfect
Solutions

Date: 14-10-2020

Ref No: SUP/IPT/20810

INDUSTRIAL IN-PLANT TRAINING CERTIFICATE

TO WHOM IT MAY CONCERN

This is to certify that **Mr. SABARISH R (920817105024)** pursuing his final year EEE at NPR College of Engineering & Technology, Natham, has undergone his In-Plant Training in our concern **from 05.10.2020 to 14.10.2020.**

We appreciate his participation with interest towards the training program.

For SUPERFECT SOLUTIONS,

AUTHORIZED SIGNATORY

SUPERFECT SOLUTIONS SALEM

SUPERFECT SOLUTIONS

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NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

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EE8017 HIGH VOLTAGE DIRECT CURRENT TRANSMISSION L T P C
3 0 0 3

OBJECTIVES

To impact knowledge on the following topics

- Planning of DC power transmission and comparison with AC powertransmission.
- HVDC converters.
- HVDC system control.
- Harmonics and design of filters.
- Power flow in HVDC system under steady state.

UNIT I INTRODUCTION 9

DC Power transmission technology–Comparison of AC and DC transmission–Application of DC transmission–Description of DC transmission system–Planning for HVDC transmission–Modern trends in HVDC technology–DC breakers–Operating problems– HVDC transmission based on VSC –Types and applications of MTDC systems.

UNIT II ANALYSIS OF HVDC CONVERTERS 9

Line commutated converter -Analysis of Graetz circuit with and without overlap -Pulse number– Choice of converter configuration – Converter bridge characteristics– Analysis of a 12 pulse converters– Analysis of VSC topologies and firing schemes.

UNIT III CONVERTER AND HVDC SYSTEM CONTROL 9

Principles of DC link control–Converter control characteristics–System control hierarchy–Firing angle control– Current and extinction angle control–Starting and stopping of DC link – Power control –Higher level controllers –Control of VSC based HVDC link.

UNIT IV REACTIVE POWER AND HARMONICS CONTROL 9

Reactive power requirements in steady state–Sources of reactive power–SVC and STATCOM– Generation of harmonics –Design of AC and DC filters– Active filters.

UNIT V POWER FLOW ANALYSIS IN AC/DC SYSTEMS 9

Per unit system for DC quantities–DC system model –Inclusion of constraints –Power flow analysis – case study

TOTAL: 45 PERIODS

OUTCOMES

- Ability to understand the principles and types of HVDC system.
- Ability to analyze and understand the concepts of HVDC converters.
- Ability to acquire knowledge on DC link control.
- Ability to understand the concepts of reactive power management, harmonics andpower flow analysis.
- Ability to get knowledge about Planning of DC power transmission and comparison with AC power transmission.
- Ability to understand the importance of power flow in HVDC system under steadystate.

TEXT BOOKS:

1. Padiyar,K.R.,"HVDC power transmission system", New Age International(P)Ltd. NewDelhi, Second Edition,2010.
2. Arrillaga,J.,"High Voltage Direct Current Transmission", Peter Pregrinus, London,1983.

REFERENCES

1. Kundur P.," Power System Stability and Control", McGraw-Hill,1993.
2. Colin Adamson and Hingorani NG," High Voltage Direct Current Power Transmission", Garraway Limited, London, 1960.
3. Edward Wilson Kimbark," Direct Current Transmission", Vol.I, Wiley inter science, New York, London, Sydney,1971.

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DISTRIBUTION TRANSFORMER HEALTH MONITORING SIMULATION SYSTEM BASED ON IOT

A MINI PROJECT REPORT

Submitted by

ABDUL AJEESH A

DIVAKAR M

ARUNKUMAR P

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

ELECTRICAL AND ELECTRONICS ENGINEERING

NPR COLLEGE OF ENGINEERING AND TECHNOLOGY, NATHAM

ANNA UNIVERSITY::CHENNAI 600 025

APRIL 2020

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

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BONAFIDE CERTIFICATE

Certified that this mini project report **"DISTRIBUTION TRANSFORMER HEALTH MONITORING SIMULATION SYSTEM BASED ON IOT"** is the bonafide work of **"A.ABDUL AJEESH (920817105001), M.DIVAKAR (920817105009), P.ARUNKUMAR (920817105004)"** who carried out the project work under my supervision.

SIGNATURE

Mr.G.ELANGOVAN, M.E., (Ph.D).,

HEAD OF THE DEPARTMENT,
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SIGNATURE

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SUPERVISOR,
Assistant Professor,
Department of Electrical and
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Natham-634 401

Submitted for the Project viva-voce examination held on 28.04.2020

INTERNAL EXAMINER

EXTERNAL EXAMINER

NPR COLLEGE OF ENGG. & TECHNOLOGY ★ NATHAM

Dr. J.SUNDARARAJAN,
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ABSTRACT

Transformer is one of the important electrical equipment that is used everywhere. Monitoring transformer's health had become a fiery task. Since in case of any damaged in the internal properties of the transformer will result in huge drawback. So it is mandatory to regularly keep an eye of the transformer. The main objective of this proposal is to simulate and acquire live data of transformer health remotely over the internet using Internet of Things technology. We are going to monitor the transformer parameter such as temperature, current, level. These data will be sent over internet using TCP / IP protocol. In case of any power failure the user will be notified with an alert message using GSM module. It also has a unique feature of detecting the phase failure. If any phase gets defect then it will indicated in the development board by an LED. These parameters will be displayed in an android application. By this process we can get to know the health of the transformer regularly and necessary step can be taken to maintain it in a proper way.

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CONCLUSION

Currently there is no accurate monitoring methodology for distribution transformers. Protective devices are available only to prevent occurrence of fault and will be useful at the time of fault. To design, simulate and implement an embedded mobile & IoT system to measure current, oil level & oil temperature of the transformer. By continuous monitoring transformer faults can be predicted and prevented.

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EE8015 ELECTRIC ENERGY GENERATION, UTILIZATION AND CONSERVATION

L T P C
3 0 0 3

OBJECTIVES

To impact knowledge on the following topics

- To study the generation, conservation of electrical power and energy efficient equipments.
- To understand the principle, design of illumination systems and energy efficiency lamps.
- To study the methods of industrial heating and welding.
- To understand the electric traction systems and their performance.

UNIT I ILLUMINATION 9

Importance of lighting – properties of good lighting scheme – laws of illumination – photometry - types of lamps – lighting calculations – basic design of illumination schemes for residential, commercial, street lighting, factory lighting and flood lighting – LED lighting and energy efficient lamps.

UNIT II REFRIGERATION AND AIR CONDITIONING 9

Refrigeration-Domestic refrigerator and water coolers - Air-Conditioning-Various types of air-conditioning system and their applications, smart air conditioning units - Energy Efficient motors: Standard motor efficiency, need for efficient motors, Motor life cycle, Direct Savings and payback analysis, efficiency evaluation factor.

UNIT III HEATING AND WELDING 9

Role of electric heating for industrial applications – resistance heating – induction heating – dielectric heating - electric arc furnaces. Brief introduction to electric welding – welding generator, welding transformer and the characteristics.

UNIT IV TRACTION 9

Merits of electric traction — requirements of electric traction system — supply systems — mechanics of train movement – traction motors and control – braking – recent trends in electric traction.

UNIT V DOMESTIC UTILIZATION OF ELECTRICAL ENERGY 9

Domestic utilization of electrical energy – House wiring. Induction based appliances, Online and OFF line UPS, Batteries - Power quality aspects – nonlinear and domestic loads – Earthing – Domestic, Industrial and Substation.

TOTAL : 45 PERIODS

OUTCOMES

- To understand the main aspects of generation, utilization and conservation.
- To identify an appropriate method of heating for any particular industrial application.
- To evaluate domestic wiring connection and debug any faults occurred.
- To construct an electric connection for any domestic appliance like refrigerator as well as to design a battery charging circuit for a specific household application.
- To realize the appropriate type of electric supply system as well as to evaluate the performance of a traction unit.
- To understand the main aspects of Traction.

TEXT BOOKS:

1. Wadhwa, C.L. "Generation, Distribution and Utilization of Electrical Energy", New Age International Pvt. Ltd, 2003.
2. Dr. Uppal S.L. and Prof. S. Rao, 'Electrical Power Systems', Khanna Publishers, NewDelhi, 15th Edition, 2014.
3. Energy Efficiency in Electric Utilities, BEE Guide Book, 2010.

REFERENCES

1. Partab.H, "Art and Science of Utilisation of Electrical Energy", Dhanpat Rai and Co, New Delhi, 2004.
2. Openshaw Taylor.E, "Utilization of Electrical Energy in SI Units", Orient Longman Pvt. Ltd, 2003.
3. Gupta.J.B, "Utilization of Electric Power and Electric Traction", S.K.Kataria and Sons, 2002.
4. Cleaner Production – Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by National Productivity Council.

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DISTRIBUTION TRANSFORMER HEALTH MONITORING SYSTEM BASED ON IOT

A PROJECT REPORT

Submitted by

ABDUL AJEESH A

DIVAKAR M

ARUNKUMAR P

in partial fulfillment for the award of the degree

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APRIL 2021

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BONAFIDE CERTIFICATE

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SIGNATURE

Mr.G.ELANGOVAN, M.E., (Ph.D).,

HEAD OF THE DEPARTMENT,
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SIGNATURE

Mrs.E.THANGADEEPIKA,M.E.,

SUPERVISOR,
Assistant Professor,
Department of Electrical and
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NPR College of Engineering and
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Natham-634 401

Submitted for the Project viva-voce examination held on 23.04.2021

INTERNAL EXAMINER

EXTERNAL EXAMINER

NPR College of Engineering & Technology ★ NATHAM

Dr. J.SUNDARARAJAN,
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ABSTRACT

Transformer is one of the important electrical equipment that is used everywhere. Monitoring transformer's health had become a fiery task. Since in case of any damaged in the internal properties of the transformer will result in huge drawback. So it is mandatory to regularly keep an eye of the transformer. The main objective of this proposal is to acquire live data of transformer health remotely over the internet using Internet of Things technology. We are going to monitor the transformer parameter such as temperature, current, level. These data will be sent over internet using TCP / IP protocol. In case of any power failure the user will be notified with an alert message using GSM module. It also has a unique feature of detecting the phase failure. If any phase gets defect then it will indicated in the development board by an LED. These parameters will be displayed in an android application. By this process we can get to know the health of the transformer regularly and necessary step can be taken to maintain it in a proper way.

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CHAPTER 6

CONCLUSION

6.1 CONCLUSION

Currently there is no monitoring methodology for distribution transformers. Protective devices are available only to prevent occurrence of fault and will be useful at the time of fault. To design and implement an embedded mobile & IoT system to measure current, oil level & oil temperature of the transformer. By continuous monitoring transformer faults can be predicted and prevented.

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EE8301 **ELECTRICAL MACHINES-I** L T P C
3 0 0 3

OBJECTIVES

To impact knowledge on the following topics

- Magnetic-circuit analysis and introduce magnetic materials
- Constructional details, the principle of operation, prediction of performance, the methods of testing the transformers and three phase transformer connections.\
- Working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines.
- Working principles of DC machines as Generator types, determination of their no- load/load characteristics, starting and methods of speed control of motors.
- Various losses taking place in D.C. Motor and to study the different testing methods to arrive at their performance.

UNIT I MAGNETIC CIRCUITS AND MAGNETIC MATERIALS 6+6

Magnetic circuits –Laws governing magnetic circuits - Flux linkage, Inductance and energy – Statically and dynamically induced EMF - Torque — Properties of magnetic materials, Hysteresis and Eddy Current losses - AC excitation, introduction to permanent magnets- Transformer as a magnetically coupled circuit.

UNIT II TRANSFORMERS 6+6

Construction – principle of operation – equivalent circuit parameters – phasor diagrams, losses – testing – efficiency and voltage regulation-all day efficiency-Sumpner's test, per unit representation – inrush current - three phase transformers-connections – Scott Connection – Phasing of transformer– parallel operation of three phase transformers-auto transformer –tap changing transformers- tertiary winding.

UNIT III ELECTROMECHANICAL ENERGY CONVERSION AND CONCEPTS IN ROTATING MACHINES 6+6

Energy in magnetic system – Field energy and co energy-force and torque equations – singly and multiply excited magnetic field systems-mmf of distributed windings – Winding Inductances-, magnetic fields in rotating machines – rotating mmf waves – magnetic saturation and leakage fluxes.

UNIT IV DC GENERATOR 6+6

Construction and components of DC Machine — Principle of operation - Lap and wave windings- EMF equations– circuit model — armature reaction –methods of excitation- commutation - interpoles compensating winding –characteristics of DC generators.

UNIT V DC MOTORS 6+6

Principle and operations - types of DC Motors – Speed Torque Characteristics of DC Motors- starting and speed control of DC motors –Plugging, dynamic and regenerative braking- testing and efficiency – Retardation test- Swinburne's test and Hopkinson's test - Permanent Magnet DC (PMDC)motors- applications of DC Motor.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to analyze the magnetic-circuits.
- Ability to acquire the knowledge in constructional details of transformers.
- Ability to understand the concepts of electromechanical energy conversion.
- Ability to acquire the knowledge in working principles of DC Generator.
- Ability to acquire the knowledge in working principles of DC Motor
- Ability to acquire the knowledge in various losses taking place in D.C. Machines

TEXT BOOKS:

1. Stephen J. Chapman, 'Electric Machinery Fundamentals'4th edition, McGraw Hill Education Pvt. Ltd, 2010.
2. P.C. Sen'Principles of Electric Machines and Power Electronics' John Wiley & Sons;3rd Edition 2013.
3. Nagrath, I.J. and Kothari.D.P., Electric Machines', McGraw-Hill Education, 2004

REFERENCES

1. Theodore Wildi, "Electrical Machines, Drives, and Power Systems", Pearson Education., (5th Edition), 2002.
2. B.R. Gupta ,'Fundamental of Electric Machines' New age International Publishers,3rd Edition ,Reprint 2015.
3. S.K. Bhattacharya, 'Electrical Machines' McGraw - Hill Education, New Delhi, 3rdEdition,2009.
4. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.
5. Surinder Pal Bali, 'Electrical Technology Machines & Measurements, Vol.II, Pearson,2013.
6. Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', Sixth edition, McGraw Hill Books Company, 2003.

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
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Natham, Dindigul (Dt) - 624 401.

NANO
TECH GROUPS

Date: 24.10.2020

To

The Principal,

NPR College of Engineering & Technology,

Natham.

Sir,

Sub: Permission for In-plant training-reg

Ref: NPRCET/OFF/EEE/IPT-02/2020-2021 dated: 22.10.2020.

With reference to your letter we are pleased to grant permission for Ms.V.Monika (920818105005), Mr. R.B.Saran (920818105007), Mr. K.Vigneshwaran (920818105701) of third year Electrical and Electronics Engineering of your institution to undergo In-plant training in our concern from 29.10.2020 to 08.11.2020.

With Regards,

NANO TECH GROUPS
No:31/588, 5th Cross
Shanmuga Nagar, U.K.T. Malai
Trichy- 620 102
Cell:98948 90200, 88070 90200

NPR COLLEGE OF ENGG. & TECHNOLOGY
NATHAM

Dr. J.SUNDARARAJAN, M.E., M.Tech., Ph.D.,
Principal
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NANO
TECH GROUPS

Date: 08.11.2020

TO WHOMSOEVER IT MAY CONCERN

This is to certify that the students of third year EEE of NPR College of Engineering & Technology, Natham has successfully done the In-plant training in our concern from 29.10.2020 to 08.11.2020.

During this period their conduct was sincere and hardworking.

S. No.	Name of the Student	Register Number	Year & Branch
1.	Ms.V.Monika	920818105005	III & EEE
2.	Mr. R.B.Saran	920818105007	III & EEE
3.	Mr. K.Vigneshwaran	920818105701	III & EEE

With Regards,

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No:31/588, 5th Cross
Shanmuga Nagar, U.K.T. Malai
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NPR COLLEGE OF ENGG & TECHNOLOGY
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ME8792 **POWER PLANT ENGINEERING** L T P C
3 0 0 3

OBJECTIVES

- Providing an overview of Power Plants and detailing the role of Mechanical Engineers in their operation and maintenance.

UNIT I COAL BASED THERMAL POWER PLANTS 9

Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers, FBC Boilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants — Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogeneration systems.

UNIT II DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 9

Otto, Diesel, Dual & Brayton Cycle - Analysis & Optimisation. Components of Diesel and Gas Turbine power plants. Combined Cycle Power Plants. Integrated Gasifier based Combined Cycle systems.

UNIT III NUCLEAR POWER PLANTS 9

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada Deuterium-Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors. Safety measures for Nuclear Power plants.

UNIT IV POWER FROM RENEWABLE ENERGY 9

Hydro Electric Power Plants — Classification, Typical Layout and associated components including Turbines. Principle, Construction and working of Wind, Tidal, Solar Photo Voltaic (SPV), Solar Thermal, Geo Thermal, Biogas and Fuel Cell power systems.

UNIT V ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS 9

Power tariff types, Load distribution parameters, load curve, Comparison of site selection criteria, relative merits & demerits, Capital & Operating Cost of different power plants. Pollution control technologies including Waste Disposal Options for Coal and Nuclear Power Plants.

TOTAL: 45 PERIODS

OUTCOMES

Upon the completion of this course the students will be able to

- Explain the layout, construction and working of the components inside a thermal power plant.
- Explain the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants.
- Explain the layout, construction and working of the components inside nuclear power plants.
- Explain the layout, construction and working of the components inside Renewableenergy power plants.
- Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energyproduction.

TEXT BOOK:

1. Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw — Hill Publishing CompanyLtd., 2008.

REFERENCES

1. El-Wakil. M.M., "Power Plant Technology", Tata McGraw — Hill Publishing Company Ltd.,2010.
2. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", Second Edition, Standard Handbook of McGraw – Hill, 1998.

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ARCHITECTURES AND CONTROL OF AN ELECTRIC VEHICLES CHARGING STATION SIMULATION USING A BIPOLAR BUS

A MINI PROJECT REPORT

Submitted by

DINESH KUMAR K

RUBA KUMAR B

SENTHIL KUMARAN V

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

ELECTRICAL AND ELECTRONICS ENGINEERING

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APRIL 2020

COLLEGE OF ENGG & TECHNOLOGY NPR NATHAM

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BONAFIDE CERTIFICATE

Certified that this mini project report **"ARCHITECTURE AND CONTROL OF AN ELECTRIC VEHICLES CHARGING STATION SIMULATION USING A BIPOLAR BUS"** is the bonafide work of **"K.DINESH KUMAR (920817105022), B.RUBAKUMAR (920817105017), V.SENTHIL KUMARAN (920817105027)"** who carried out the project work under my supervision.

SIGNATURE

Mr.G.ELANGOVAN, M.E., (Ph.D).,

HEAD OF THE DEPARTMENT,
Department of Electrical and
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NPR College of Engineering and
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Mrs.S.T.SARANYA, M.E.,

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Assistant Professor,
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NPR College of Engineering and
Technology,
Natham-634 401

Submitted for the Project viva-voce examination held on 28.04.2020

INTERNAL EXAMINER

EXTERNAL EXAMINER

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
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ABSTRACT

This work proposes a novel architecture for plug-in electric vehicles (PEVs) dc charging station at the megawatt level, through the use of a grid-tied neutral point clamped (NPC) converter. The proposed bipolar dc structure reduces the step-down effort on the dc–dc fast chargers. In addition, this work proposes a balancing mechanism that allows handling any difference on the dc loads while keeping the midpoint voltage accurately regulated. By formally defining the unbalance operation limit, the proposed control scheme is able to provide complementary balancing capabilities by the use of an additional NPC leg acting as a bidirectional dc–dc stage, simulating the minimal load condition and allowing the modulator to keep the control on the dc voltages under any load scenario. The proposed solution enables fast charging for PEVs concentrating several charging units into a central grid-tied converter. In this work, simulation was done for charging station architecture.

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CONCLUSION

A novel architecture for fast charging stations for PEVs has been proposed, simulated and validated. It is based in the use of a single grid-tied NPC converter, enabling a bipolar dc bus. Its main features are the megawatt range capability, a single ac–dc stage for powering several charging units, the maintenance of the step-down effort of the chargers, balanced operation during any load scenario, and the possibility to include additional storage or generating units into the system. The structure can be installed in different locations within the city, enabling alternatives for refuelling the PEVs in shorter times, in order to increase its acceptance. The use of a multilevel converter also enables the application in MV (lower currents, smaller ac chokes), and improved THD and power quality. In addition, it enables a possible scale up in the power ratings if needed. The limited unbalanced operation of the converter was used to provide a complementary solution and overcome its limits, enabling the operation in any load scenario.

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EE8401 **ELECTRICAL MACHINES-II** L T P C
2 2 0 3

OBJECTIVES

To impart knowledge on the following Topics

- Construction and performance of salient and non — salient type synchronousgenerators.
- Principle of operation and performance of synchronous motor.
- Construction, principle of operation and performance of induction machines.
- Starting and speed control of three-phase induction motors.
- Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I SYNCHRONOUS GENERATOR 6+6

Constructional details – Types of rotors –winding factors- emf equation – Synchronous reactance – Armature reaction – Phasor diagrams of non salient pole synchronous generator connected to infinite bus--Synchronizing and parallel operation – Synchronizing torque -Change of excitation and mechanical input- Voltage regulation – EMF, MMF, ZPFand A.S.A methods – steady state power-angle characteristics– Two reaction theory –sliptest -short circuit transients - Capability Curves

UNIT II SYNCHRONOUS MOTOR 6+6

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted Vcurves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – natural frequency of oscillations – damper windings- synchronous condenser.

UNIT III THREE PHASE INDUCTION MOTOR 6+6

Constructional details — Types of rotors — Principle of operation — Slip –cogging and crawling- Equivalent circuit – Torque-Slip characteristics - Condition for maximum torque –Losses and efficiency — Load test - No load and blocked rotor tests - Circle diagram — Separation of losses – Double cage induction motors –Induction generators – Synchronousinduction motor.

UNIT IV SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 6+6

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star- delta starters – Speed control – Voltage control, Frequency control and pole changing – Cascaded connection-V/f control – Slip power recovery scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 6+6

Constructional details of single phase induction motor – Double field revolving theory andoperation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Shaded pole induction motor - Linear induction motor — Repulsion motor - Hysteresis motor - AC series motor- Servo motors- Stepper motors - introduction to magnetic levitation systems.

TOTAL: 45 PERIODS

OUTCOMES

- Ability to understand the construction and working principle of SynchronousGenerator
- Ability to understand MMF curves and armature windings.
- Ability to acquire knowledge on Synchronous motor.

- Ability to understand the construction and working principle of Three phase InductionMotor
- Ability to understand the construction and working principle of Special Machines
- Ability to predetermine the performance characteristics of Synchronous Machines.

TEXT BOOKS:

1. A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 'Electric Machinery', Mc Graw Hill publishing Company Ltd, 2003.
2. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.
3. Stephen J. Chapman, 'Electric Machinery Fundamentals'4th edition, McGraw HillEducation Pvt. Ltd, 2010.

REFERENCES

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing Company Ltd, 2002.
2. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.
3. M.N. Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVTLTD.,New Delhi, 2009.
4. B.R.Gupta, 'Fundamental of Electric Machines' New age International Publishers,3rd Edition ,Reprint 2015.
5. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt. Ltd, 2002.
6. Alexander S. Langsdorf, 'Theory of Alternating-Current Machinery', McGraw Hill Publications, 2001.

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ARCHITECTURE AND CONTROL OF AN ELECTRIC VEHICLES CHARGING STATION USING A BIPOLAR BUS

A PROJECT REPORT

Submitted by

DINESH KUMAR K

RUBA KUMAR B

SENTHIL KUMARAN V

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

ELECTRICAL AND ELECTRONICS ENGINEERING

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BONAFIDE CERTIFICATE

Certified that this project report **"ARCHITECTURE AND CONTROL OF AN ELECTRIC VEHICLES CHARGING STATION USING A BIPOLAR BUS"** is the bonafide work of **"K.DINESH KUMAR (920817105022), B.RUBAKUMAR (920817105017), V.SENTHIL KUMARAN (920817105027)"** who carried out the project work under my supervision.

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ABSTRACT

This project proposes a novel architecture for plug-in electric vehicles (PEVs) dc charging station at the megawatt level, through the use of a grid-tied neutral point clamped (NPC) converter. The proposed bipolar dc structure reduces the step-down effort on the dc–dc fast chargers. In addition, this paper proposes a balancing mechanism that allows handling any difference on the dc loads while keeping the midpoint voltage accurately regulated. By formally defining the unbalance operation limit, the proposed control scheme is able to provide complementary balancing capabilities by the use of an additional NPC leg acting as a bidirectional dc–dc stage, simulating the minimal load condition and allowing the modulator to keep the control on the dc voltages under any load scenario. The proposed solution enables fast charging for PEVs concentrating several charging units into a central grid-tied converter. In this paper, simulation and experimental results are presented to validate the proposed charging station architecture.

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CHAPTER 6

CONCLUSION

6.1 CONCLUSION

A novel architecture for fast charging stations for PEVs has been proposed and validated. It is based in the use of a single grid-tied NPC converter, enabling a bipolar dc bus. Its main features are the megawatt range capability, a single ac–dc stage for powering several charging units, the maintenance of the step-down effort of the chargers, balanced operation during any load scenario, and the possibility to include additional storage or generating units into the system. The structure can be installed in different locations within the city, enabling alternatives for refuelling the PEVs in shorter times, in order to increase its acceptance. The use of a multilevel converter also enables the application in MV (lower currents, smaller ac chokes), and improved THD and power quality. In addition, it enables a possible scale up in the power ratings if needed. The limited unbalanced operation of the converter was used to provide a complementary solution and overcome its limits, enabling the operation in any load scenario.

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EE8402 TRANSMISSION AND DISTRIBUTION L T P C 3 0 0 3

OBJECTIVES

- To study the structure of electric power system and to develop expressions for thecomputation of transmission line parameters.
- To obtain the equivalent circuits for the transmission lines based on distance and todetermine voltage regulation and efficiency.
- To understand the mechanical design of transmission lines and to analyze thevoltage distribution in insulator strings to improve the efficiency.
- To study the types, construction of cables and methods to improve the efficiency.
- To study about distribution systems, types of substations, methods of grounding, EHVAC, HVDC and FACTS.

UNIT I TRANSMISSION LINE PARAMETERS 9

Structure of Power System - Parameters of single and three phase transmission lines with single and double circuits -Resistance, inductance and capacitance of solid, stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition - applicationof self and mutual GMD; skin and proximity effects -Typical configurations, conductor types and electrical parameters of EHV lines.

UNIT II MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

Performance of Transmission lines - short line, medium line and long line - equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance -transmission efficiency and voltage regulation, real and reactive power flow in lines - Power Circle diagrams - Formation of Corona – Critical Voltages – Effect on Line Performance.

UNIT III MECHANICAL DESIGN OF LINES 9

Mechanical design of OH lines — Line Supports –Types of towers — Stress and Sag Calculation — Effects of Wind and Ice loading. Insulators: Types, voltage distribution in insulator string, improvement of string efficiency, testing of insulators.

UNIT IV UNDER GROUND CABLES 9

Underground cables - Types of cables — Construction of single core and 3 core cables -Insulation Resistance – Potential Gradient - Capacitance of Single-core and 3 core cables - Grading of cables - Power factor and heating of cables – DC cables.

UNIT V DISTRIBUTION SYSTEMS 9

Distribution Systems — General Aspects — Kelvin's Law — AC and DC distributions Techniques of Voltage Control and Power factor improvement – Distribution Loss –Typesof Substations -Methods of Grounding – Trends in Transmission and Distribution: EHVAC, HVDC and FACTS (Qualitative treatment only).

TOTAL: 45 PERIODS

OUTCOMES

- To understand the importance and the functioning of transmission line parameters.
- To understand the concepts of Lines and Insulators.
- To acquire knowledge on the performance of Transmission lines.
- To understand the importance of distribution of the electric power in power system.
- To acquire knowledge on Underground Cables

- To become familiar with the function of different components used in Transmission and Distribution levels of power system and modelling of these components.

TEXT BOOKS:

1. D.P.Kothari, I.J. Nagarath, 'Power System Engineering', Mc Graw-Hill Publishing Company limited, New Delhi, Second Edition, 2008.
2. C.L.Wadhwa, 'Electrical Power Systems', New Academic Science Ltd, 2009.
3. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, Second Edition, 2011.

REFERENCES

1. B.R.Gupta, 'Power System Analysis and Design' S. Chand, New Delhi, Fifth Edition, 2008.
2. Luces M.Fualken berry, Walter Coffer, 'Electrical Power Distribution and Transmission', Pearson Education, 2007.
3. Arun Ingole, "power transmission and distribution" Pearson Education, 2017
4. J.Brian, Hardy and Colin R.Bayliss 'Transmission and Distribution in Electrical Engineering', Newnes; Fourth Edition, 2012.
5. G.Ramamurthy, "Handbook of Electrical power Distribution," Universities Press,2013.

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Date: 30.10.2020

To

The Principal,
NPR College of Engineering & Technology,
Natham, Dindigul – 624 401

Dear Sir,

Sub: Permission for Internship-reg

Ref: NPRCET/OFF/EEE/INT-02/2020-2021 Dated: 28.10.2020.

With respect to reference cited above, we permit Mr. LOGESHWARAN N (920819105007), Mr. PITCHIYATHA D (920819105009), Mr. POORNAKUMAR V (920819105010), Mr. RAJAMURUGAN M (920819105012), Mr. RAJASEKAR M (920819105013) of Second year Electrical and Electronics Engineering to undergo online internship in our organization from 02.11.2020 to 07.12.2020.

Thank you.

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Date: 07.12.2020

To whomsoever it may concern

This is to certify that **Mr. PITCHIYATHA D (920819105009)**, Second year EEE of NPR College of Engineering &Technology, Natham has undergone online internship training in our organization from **02.11.2020 to 07.12. 2020.**

We appreciate his participation with interest towards the training program.

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This is to certify that **Mr. RAJAMURUGAN M (920819105012),** Second year EEE of NPR College of Engineering & Technology, Natham has undergone online internship training in our organization from **02.11.2020 to 07.12. 2020.**

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This is to certify that **Mr. LOGESHWARAN N (920819105007),** Second year EEE of NPR College of Engineering &Technology, Natham has undergone Internship training in our organization from **02.11.2020 to 07.12. 2020.**

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EE8451 LINEAR INTEGRATED CIRCUITS AND APPLICATIONS L T P C
3 0 0 3

OBJECTIVES

To impart knowledge on the following topics

- Signal analysis using Op-amp based circuits.
- Applications of Op-amp.
- Functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits.
- IC fabrication procedure.

UNIT I IC FABRICATION 9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance, FETs and PV Cell.

UNIT II CHARACTERISTICS OF OPAMP 9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – Inverting and Non-inverting Amplifiers, summer, differentiator and integrator-V/I & I/V converters.

UNIT III APPLICATIONS OF OPAMP 9

Instrumentation amplifier and its applications for transducer Bridge, Log and Antilog Amplifiers- Analog multiplier & Divider, first and second order active filters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R- 2R ladder and weighted resistor types), A/D converters using opamps.

UNIT IV SPECIAL ICs 9

Functional block, characteristics of 555 Timer and its PWM application - IC-566 voltage controlled oscillator IC; 565-phase locked loop IC, AD633 Analog multiplier ICs.

UNIT V APPLICATION ICs 9

AD623 Instrumentation Amplifier and its application as load cell weight measurement - IC voltage regulators –LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM317, 723 Variability voltage regulators, switching regulator- SMPS - ICL 8038 function generator IC.

TOTAL: 45 PERIODS

OUTCOMES

- Ability to acquire knowledge in IC fabrication procedure
- Ability to analyze the characteristics of Op-Amp
- To understand the importance of Signal analysis using Op-amp based circuits.
- Functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits.
- To understand and acquire knowledge on the Applications of Op-amp
- Ability to understand and analyse, linear integrated circuits their Fabrication and Application.

TEXT BOOKS:

1. David A. Bell, 'Op-amp & Linear ICs', Oxford, 2013.
2. D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', II edition, New Age,2003.
3. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. 2000.

REFERENCES

1. Fiore,"Opamps & Linear Integrated Circuits Concepts & applications", Cengage, 2010.
2. Floyd ,Buchla,"Fundamentals of Analog Circuits, Pearson, 2013.
3. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digitalcircuits system', McGraw Hill, 2003.
4. Robert F.Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', Pearson, 6thedition,2012.
5. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', Mc Graw Hill, 2016.
6. Muhammad H. Rashid,' Microelectronic Circuits Analysis and Design' Cengage Learning, 2011.

A SIMULATION OF THREE PHASE SINGLE-STAGE AC-DC WIRELESSPOWER TRANSFER CONVERTER WITH POWERFACTOR CORRECTION AND BUS VOLTAGECONTROL

A MINI PROJECT REPORT

Submitted by

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in partial fulfillment for the award of the degree

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BONAFIDE CERTIFICATE

Certified that this mini project report **"A SIMULATION OF THREE PHASE SINGLE-STAGE AC-DC WIRELESS POWER TRANSFER CONVERTER WITH POWER FACTOR CORRECTION AND BUS VOLTAGE CONTROL"** is the bonafide work of **"A.CIPRA (920817105006), M.NISHA (920817105018), A.MUHILVANI (920817105301)"** who carried out the project work under my supervision.

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ABSTRACT

Wireless Power Transfer technology has been a research and industrial hotspot with applications in many areas, such as wireless electric vehicle charging system which requires high power, high efficiency and high power factor. Usually, the power is drawn from 50/60 Hz single phase or three phase AC power source. For a high power application, a three phase AC source is commonly used. In this project, a three phase single stage wireless power transfer resonant converter with power factor correction and bus voltage control is proposed to improve efficiency and power quality of three phase input, and reduce production cost and complexity for high power wireless power transfer system. A T-type topology is applied as the common part to perform both the power factor correction and DC-DC wireless power transfer functionalities simultaneously.

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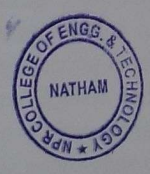
CONCLUSION

A simulation of three-phase single-stage AC-DC WPT resonant converter with PFC is firstly proposed, studied, and developed. The proposed topology combines a three-phase rectifier bridge and a T-type three-level inverter together to realize the functionalities of AC-DC power factor correction and DC-DCWPT simultaneously. The proposed three-phase topology exhibits much better performance of PFC than the single-phase topology because it can naturally eliminate zero-sequence harmonics of input current, especially for third-order harmonic. Doubtlessly, three-phase topologies are capable of handling higher power than single-phase topologies, therefore, in high power WPT applications, such as 7.7kW, 11.1kW, and 22Kw wireless EV charging system, the proposed three-phase single-stage AC-DC WPT resonant converter holds advantage. As the bus voltage is maintained constant at different load conditions by regulating operation frequency and duty cycle simultaneously, it will not raise too high when load condition varies.



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IC8451 **CONTROL SYSTEMS** L T P C
0 0 4 2

OBJECTIVES

To impart knowledge on the following topics

- To understand the use of transfer function models for analysis physical systems andintroduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state erroranalysis.
- To accord basic knowledge in obtaining the open loop and closed–loop frequencyresponses of systems.
- To introduce stability analysis and design of compensators
- To introduce state variable representation of physical systems

UNIT I SYSTEMS AND REPRESENTATION 9

Basic elements in control systems: — Open and closed loop systems — Electrical analogy of mechanical and thermal systems – Transfer function – AC and DC servomotors – Block diagram reduction techniques — Signal flow graphs.

UNIT II TIME RESPONSE 9

Time response: – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – Root locus construction- Effects of P, PI, PID modes of feedback control –Time response analysis.

UNIT III FREQUENCY RESPONSE 9

Frequency response: – Bode plot – Polar plot – Determination of closed loop response from open loop response - Correlation between frequency domain and time domain specifications

UNIT IV STABILITY AND COMPENSATOR DESIGN 9

Characteristics equation – Routh Hurwitz criterion – Nyquist stability criterion- Performance criteria –Effect of Lag, lead and lag-lead compensation on frequency response-Design of Lag, lead and lag-lead compensator using bode plots.

UNIT V STATE VARIABLE ANALYSIS 9

Concept of state variables – State models for linear and time invariant Systems – Solution of state and output equation in controllable canonical form – Concepts of controllability and observability.

TOTAL (L: 45+T:30): 75 PERIODS

OUTCOMES

At the end of the course, the student should have the:

- Ability to develop various representations of system based on the knowledge of Mathematics, Science and Engineering fundamentals.
- Ability to do time domain and frequency domain analysis of various models of linearsystem.
- Ability to interpret characteristics of the system to develop mathematical model.
- Ability to design appropriate compensator for the given specifications.
- Ability to come out with solution for complex control problem.
- Ability to understand use of PID controller in closed loop system.

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TEXT BOOKS:

1. Nagarath, I.J. and Gopal, M., "Control Systems Engineering", New Age International Publishers, 2017.
2. Benjamin C. Kuo, "Automatic Control Systems", Wiley, 2014.

REFERENCES

1. Katsuhiko Ogata, "Modern Control Engineering", Pearson, 2015.
2. Richard C.Dorf and Bishop, R.H., "Modern Control Systems", Pearson Education,2009.
3. John J.D., Azzo Constantine, H. and Houpis Sttuart, N Sheldon, "Linear Control System Analysis and Design with MATLAB", CRC Taylor& Francis Reprint 2009.
4. Rames C.Panda and T. Thyagarajan, "An Introduction to Process Modelling Identification and Control of Engineers", Narosa Publishing House, 2017.
5. M.Gopal, "Control System: Principle and design", McGraw Hill Education, 2012.
6. NPTEL Video Lecture Notes on "Control Engineering "by Prof. S. D. Agashe, IIT Bombay.

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A THREE PHASE SINGLE-STAGE AC-DC WIRELESS POWER TRANSFER CONVERTER WITH POWER FACTOR CORRECTION AND BUS VOLTAGE CONTROL

A PROJECT REPORT

Submitted by

CIPRA A

NISHA M

MUHILVANI A

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

ELECTRICAL AND ELECTRONICS ENGINEERING

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BONAFIDE CERTIFICATE

Certified that this project report **"A THREE PHASE SINGLE-STAGE AC-DC WIRELESS POWER TRANSFER CONVERTER WITH POWER FACTOR CORRECTION AND BUS VOLTAGE CONTROL"** is the bonafide work of **"A.CIPRA (920817105006), M.NISHA (920817105018), A.MUHILVANI (920817105301)"** who carried out the project work under my supervision.

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Natham-634 401

Submitted for the Project viva-voce examination held on 23.04.2021

INTERNAL EXAMINER

EXTERNAL EXAMINER

NPR COLLEGE OF ENGG & TECHNOLOGY NATHAM

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Principal
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ABSTRACT

Wireless Power Transfer technology has been a research and industrial hotspot with applications in many areas, such as wireless electric vehicle charging system which requires high power, high efficiency and high power factor. Usually, the power is drawn from 50/60 Hz single phase or three phase AC power source. For a high power application, a three phase AC source is commonly used. In this project, a three phase single stage wireless power transfer resonant converter with power factor correction and bus voltage control is proposed to improve efficiency and power quality of three phase input, and reduce production cost and complexity for high power wireless power transfer system. A T-type topology is applied as the common part to perform both the power factor correction and DC-DC wireless power transfer functionalities simultaneously.

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CHAPTER 6
CONCLUSION

6.1 CONCLUSION

A three-phase single-stage AC-DC WPT resonant converter with PFC is firstly proposed, studied, and developed. The proposed topology combines a three-phase rectifier bridge and a T-type three-level inverter together to realize the functionalities of AC-DC power factor correction and DC-DC WPT simultaneously. The proposed three-phase topology exhibits much better performance of PFC than the single-phase topology because it can naturally eliminate zero-sequence harmonics of input current, especially for third-order harmonic. Doubtlessly, three-phase topologies are capable of handling higher power than single-phase topologies, therefore, in high power WPT applications, such as 7.7 kW, 11.1 kW, and 22 kW wireless EV charging system, the proposed three-phase single-stage AC-DC WPT resonant converter holds advantage. As the bus voltage is maintained constant at different load conditions by regulating operation frequency and duty cycle simultaneously, it will notraise too high when load condition varies.

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EE8501 POWER SYSTEM ANALYSIS L T P C
3 0 0 3

OBJECTIVES

- To model the power system under steady state operating condition
- To understand and apply iterative techniques for power flow analysis
- To model and carry out short circuit studies on power system
- To model and analyze stability problems in power system

UNIT I POWER SYSTEM 9

Need for system planning and operational studies - Power scenario in India - Power system components — Representation - Single line diagram - per unit quantities - p.u. impedance diagram - p.u. reactance diagram - Network graph, Bus incidence matrix, Primitive parameters, Bus admittance matrix from primitive parameters - Representation of off- nominal transformer - Formation of bus admittance matrix of large power network.

UNIT II POWER FLOW ANALYSIS 9

Bus classification - Formulation of Power Flow problem in polar coordinates - Power flow solution using Gauss Seidel method - Handling of Voltage controlled buses - Power Flow Solution by Newton Raphson method.

UNIT III SYMMETRICAL FAULT ANALYSIS 9

Assumptions in short circuit analysis - Symmetrical short circuit analysis using Thevenin's theorem - Bus Impedance matrix building algorithm (without mutual coupling) - Symmetrical fault analysis through bus impedance matrix - Post fault bus voltages - Fault level - Current limiting reactors.

UNIT IV UNSYMMETRICAL FAULT ANALYSIS 9

Symmetrical components - Sequence impedances - Sequence networks - Analysis of unsymmetrical faults at generator terminals: LG, LL and LLG - unsymmetrical fault occurring at any point in a power system - computation of post fault currents in symmetrical component and phasor domains.

UNIT V STABILITY ANALYSIS 9

Classification of power system stability — Rotor angle stability - Swing equation - Swing curve - Power-Angle equation - Equal area criterion - Critical clearing angle and time - Classical step-by-step solution of the swing equation – modified Euler method.

TOTAL : 45 PERIODS

OUTCOMES

- Ability to model the power system under steady state operating condition
- Ability to understand and apply iterative techniques for power flow analysis
- Ability to model and carry out short circuit studies on power system
- Ability to model and analyze stability problems in power system
- Ability to acquire knowledge on Fault analysis.
- Ability to model and understand various power system components and carry out power flow, short circuit and stability studies.

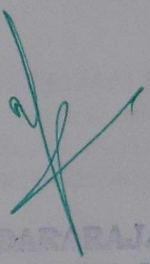
TEXT BOOKS:

1. John J. Grainger, William D. Stevenson, Jr, 'Power System Analysis', Mc Graw HillEducation (India) Private Limited, New Delhi, 2015.

2. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
3. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.

REFERENCES

1. Pai M A, 'Computer Techniques in Power System Analysis', Tata Mc Graw-Hill Publishing Company Ltd., New Delhi, Second Edition, 2007.
2. J. Duncan Glover, Mulukutla S.Sarma, Thomas J. Overbye, 'Power System Analysis & Design', Cengage Learning, Fifth Edition, 2012.
3. Gupta B.R., 'Power System - Analysis and Design', S. Chand Publishing, 2001.
4. Kundur P., 'Power System Stability and Control', Tata McGraw Hill Education Pvt.Ltd., New Delhi, 10th reprint, 2010.



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Date: 18.12.2020

To

The Principal,

NPR College of Engineering & Technology,

Natham.

Sir,

Sub: Permission for In-plant training-reg

Ref: NPRCET/OFF/EEE/IPT-03/2020-2021 dated: 15.12.2020

With reference to your letter we are pleased to grant permission for Mr. ABDUL AJEESH.A (920817105001), Mr.DINESHKUMAR K (920817105008), Mr.ARUN KUMAR.P (920817105004), Mr.DIVAKAR M (920817105009), Mr.RUBAKUMAR B (920817105023), Mr.SENTHIL KUMARAN V (920817105026) of Final year Electrical and Electronics Engineering of your institution to undergo In-plant training in our concern from 21.12.2020 to 23.01.2021.

For UMBRELLA CORPOVATION

Proprtetor

With Regards

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
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NPR COLLEGE OF ENGG. & TECHNOLOGY * NATHAM

UMBRELLA CORPORATION * TRICHY-102 *

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Date: 23.01.2021

TO WHOMSOEVER IT MAY CONCERN

This is to certify that the students of Final year EEE of NPR College of Engineering & Technology, Natham has successfully done the In-Plant training in our concern from 21.12.2020 to 23.01.2021.

During this period his conduct was sincere and hardworking.

S. No.	Name of the Student	Register Number	Year & Branch
1.	Mr.ABDUL AJEESH.A	920817105001	IV & EEE

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NPR COLLEGE OF ENGG & TECHNOLOGY ★ NATHAM ★

For UMBRELLA CORPORATION

Proprietor

With Regards

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S. No.	Name of the Student	Register Number	Year & Branch
1.	Mr.DINESHKUMAR K	920817105008	IV & EEE

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With Regards

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S. No.	Name of the Student	Register Number	Year & Branch
1.	Mr.ARUN KUMAR.P	920817105004	IV & EEE

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S. No.	Name of the Student	Register Number	Year & Branch
1.	Mr.DIVAKAR M	920817105009	IV & EEE

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Date: 23.01.2021

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S. No.	Name of the Student	Register Number	Year & Branch
1.	Mr.RUBAKUMAR B	920817105023	IV & EEE

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S. No.	Name of the Student	Register Number	Year & Branch
1.	Mr.SENTHIL KUMARAN V	920817105026	IV & EEE

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For UMBI KPOVATION

Proprtetor

With Regards

UMBRELLA CORPORATION TRICHY-102

EE8551 MICROPROCESSORS AND MICROCONTROLLERS L T P C
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OBJECTIVES

To impart knowledge on the following Topics

- Architecture of μP8085 & μC 8051
- Addressing modes & instruction set of 8085 & 8051.
- Need & use of Interrupt structure 8085 & 8051.
- Simple applications development with programming 8085 & 8051

UNIT I 8085 PROCESSOR 9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts.

UNIT II PROGRAMMING OF 8085 PROCESSOR 9

Instruction -format and addressing modes – Assembly language format – Data transfer, data manipulation& control instructions – Programming: Loop structure with counting & Indexing – Look up tability - Subroutine instructions - stack.

UNIT III 8051 MICRO CONTROLLER 9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts- Data Transfer, Manipulation, Control Algorithms& I/O instructions, Comparison to Programming concepts with 8085.

UNIT IV PERIPHERAL INTERFACING 9

Study on need, Architecture, configuration and interfacing, with ICs: 8255, 8259, 8254,8279, - A/D and D/A converters &Interfacing with 8085& 8051.

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS 9

Simple programming exercises- key board and display interface –Control of servo motor-stepper motor control- Application to automation systems.

TOTAL: 45 PERIODS

OUTCOMES

- Ability to acquire knowledge in Addressing modes & instruction set of 8085 & 8051.
- Ability to need & use of Interrupt structure 8085 & 8051.
- Ability to understand the importance of Interfacing
- Ability to explain the architecture of Microprocessor and Microcontroller.
- Ability to write the assembly language programme.
- Ability to develop the Microprocessor and Microcontroller based applications.

TEXT BOOKS:

1. Sunil Mathur &Jeebananda Panda, "Microprocessor and Microcontrollers", PHILearning Pvt. Ltd, 2016.
2. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', with8085, Wiley Eastern Ltd., New Delhi, 2013.
3. Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D.Kinely 'The 8051 Micro Controller and

Embedded Systems', PHI Pearson Education, 5th Indian reprint, 2003.

REFERENCES

1. Krishna Kant, "Microprocessor and Microcontrollers", Eastern Company Edition, Prentice Hall of India, New Delhi, 2007.
2. B.RAM," Computer Fundamentals Architecture and Organization" New age International Private Limited, Fifth edition, 2017.
3. Soumitra Kumar Mandal, Microprocessor & Microcontroller Architecture, Programming & Interfacing using 8085,8086,8051,McGraw Hill Edu,2013.
4. Ajay V.Deshmukh, 'Microcontroller Theory &Applications', McGraw Hill Edu,2016
5. Douglas V.Hall, 'Microprocessor and Interfacing', McGraw Hill Edu,2016.

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A SIMULATION OF BRIDGE HEALTH ANALYSIS USING INTERNET OF THINGS

A MINI PROJECT REPORT

Submitted by

DINESHKUMAR K

KATHIRAVAN G

PERUMAL R

PRABAKARAN S

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

ELECTRICAL AND ELECTRONICS ENGINEERING

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APRIL 2020

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BONAFIDE CERTIFICATE

Certified that this mini project report **"A SIMULATION OF BRIDGE HEALTH ANALYSIS USING INTERNET OF THINGS"** is the bonafide work of **" K.DINESH KUMAR (920817105007), G.KATHIRAVAN (920817105015), R.PERUMAL (920817105019), S.PRABAKARAN (920817105020)"** who carried out the project work under my supervision.

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ABSTRACT

Bridge monitoring system is significant to health diagnosis of railway bridges. This project proposed and developed a novel architecture for large span bridge monitoring. A 3-level distributed structure is adopted in the monitoring system which includes central server, intelligent acquisition node and local controller. Acquisition nodes are located across the bridge. All the acquisition nodes are managed by one local controller. Every acquisition node has 8channels which can sample displacement, acceleration and strain of bridge. To get high precision data, a10 bits Analog to Digital converter is used. Compared to the traditional method, the proposed architecture has two features. First, the acquisition node is a smart device based on powerful processor. Signals of field sensors are analyzed and real time compressed in the acquisition node. Only the processing results are sent to local controller through IEEE802.11 wireless network. This operation can relieve load of central server and decrease demand of communication bandwidth. Second, 2G wireless network is utilized to provide enough bandwidth for real-time data transmission between local controller and central server. The intelligent monitoring system has run on a large span railway bridge for six months. Simulated results show that the proposed system is stable and effective.

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CONCLUSION

Simulation work was carried out for Bridge health condition monitoring in real time is very popular issue. The sensor technology is continuously and condition monitoring has never been accurate and easier before. With the help of wireless technology and water level sensor, smart system is developing for securing bridges. This system checks the water level and the position of bridge for safety purpose. In the emergency conditions like earthquake, flood, etc. the facility of broadcasting the message is added. This System is unique in its ability to monitor the bridge environment; it transmits environmental data through wireless communication and sends alerts to the bridge management staff i.e. Monitoring Centre in real time for prompt. The main objective of Bridge Monitoring System using IOT is to save the lives of the people, to protect from accident.

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EE8552 **POWER ELECTRONICS** L T P C
3 0 0 3

OBJECTIVES

To impart knowledge on the following Topics

- Different types of power semiconductor devices and their switching
- Operation, characteristics and performance parameters of controlled rectifiers
- Operation, switching techniques and basics topologies of DC-DC switchingregulators.
- Different modulation techniques of pulse width modulated inverters and tounderstand harmonic reduction methods.
- Operation of AC voltage controller and various configurations.

UNIT I POWER SEMI-CONDUCTOR DEVICES 9

Study of switching devices, SCR, TRIAC, GTO, BJT, MOSFET, IGBT and IGCT- Static characteristics: SCR, MOSFET and IGBT - Triggering and commutation circuit for SCR- Introduction to Driver and snubber circuits.

UNIT II PHASE-CONTROLLED CONVERTERS 9

2-pulse, 3-pulse and 6-pulseconverters– performance parameters –Effect of source inductance—Firing Schemes for converter–Dual converters, Applications-light dimmer, Excitation system, Solar PV systems.

UNIT III DC TO DC CONVERTERS 9

Step-down and step-up chopper-control strategy– Introduction to types of choppers-A, B, C,D and E - Switched mode regulators- Buck, Boost, Buck- Boost regulator, Introduction to Resonant Converters, Applications-Battery operated vehicles.

UNIT IV INVERTERS 9

Single phase and three phase voltage source inverters (both120^0 mode and 180^0 mode)– Voltage& harmonic control--PWM techniques: Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM — Introduction to space vector modulation –Current source inverter, Applications-Induction heating, UPS.

UNIT V AC TO AC CONVERTERS 9

Single phase and Three phase AC voltage controllers–Control strategy- Power Factor Control – Multistage sequence control -single phase and three phase cyclo converters –Introduction to Matrix converters, Applications –welding .

OUTCOMES **TOTAL: 45 PERIODS**

- Ability to analyse AC-AC and DC-DC and DC-AC converters.
- Ability to choose the converters for real time applications.

TEXT BOOKS:

1. M.H. Rashid, 'Power Electronics: Circuits, Devices and Applications', Pearson Education, Third Edition, New Delhi, 2004.
2. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition, 2003.
3. Ashfaq Ahmed 'Power Electronics for Technology', Pearson Education, Indianreprint, 2003.

REFERENCES

1. Joseph Vithayathil,' Power Electronics, Principles and Applications', McGraw HillSeries, 6th Reprint, 2013.
2. Philip T. Krein, "Elements of Power Electronics" Oxford University Press, 2004Edition.
3. L. Umanand, "Power Electronics Essentials and Applications", Wiley, 2010.
4. Ned Mohan Tore. M. Undel and, William. P. Robbins, 'Power Electronics: Converters, Applications and Design', John Wiley and sons, third edition, 2003.
5. S.Rama Reddy, 'Fundamentals of Power Electronics', Narosa Publications, 2014.
6. M.D. Singh and K.B. Khanchandani, "Power Electronics," Mc Graw Hill India, 2013.
7. JP Agarwal," Power Electronic Systems: Theory and Design" 1e, Pearson Education,2002.

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BRIDGE HEALTH ANALYSIS USING INTERNET OF THINGS

A PROJECT REPORT

Submitted by

DINESHKUMAR K

KATHIRAVAN G

PERUMAL R

PRABAKARAN S

in partial fulfillment for the award of the degree

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BACHELOR OF ENGINEERING

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APRIL 2021

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ANNA UNIVERSITY::CHENNAI 600025

BONAFIDE CERTIFICATE

Certified that this project report **"BRIDGE HEALTH ANALYSIS USING INTERNET OF THINGS"** is the bonafide work of **"K.DINESH KUMAR (920817105007), G.KATHIRAVAN (920817105015), R.PERUMAL (920817105019), S.PRABAKARAN (920817105020)"** who carried out the project work under my supervision.

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Submitted for the Project viva-voce examination held on 23.04.2021

INTERNAL EXAMINER

EXTERNAL EXAMINER

COLLEGE OF ENGG. & TECHNOLOGY ★ NPR ★ NATHAM

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ABSTRACT

Bridge monitoring system is significant to health diagnosis of railway bridges. This paper proposed and developed a novel architecture for large span bridge monitoring. A 3-level distributed structure is adopted in the monitoring system which includes central server, intelligent acquisition node and local controller. Acquisition nodes are located across the bridge. All the acquisition nodes are managed by one local controller. Every acquisition node has 8 channels which can sample displacement, acceleration and strain of bridge. To get high precision data, a10 bits Analog to Digital converter is used. Compared to the traditional method, the proposed architecture has two features. First, the acquisition node is a smart device based on powerful processor. Signals of field sensors are analyzed and real time compressed in the acquisition node. Only the processing results are sent to local controller through IEEE802.11 wireless network. This operation can relieve load of central server and decrease demand of communication bandwidth. Second, 2G wireless network is utilized to provide enough bandwidth for real-time data transmission between local controller and central server. The intelligent monitoring system has run on a large span railway bridge for six months. Running results show that the proposed system is stable and effective.

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CHAPTER 6

CONCLUSION

6.1 CONCLUSION

Bridge health condition monitoring in real time is very popular issue. The sensor technology is continuously and condition monitoring has never been accurate and easier before. With the help of wireless technology and water level sensor, smart system is developing for securing bridges. This system checks the water level and the position of bridge for safety purpose. In the emergency conditions like earthquake, flood, etc. the facility of broadcasting the message is added. This System is unique in its ability to monitor the bridge environment; it transmits environmental data through wireless communication and sends alerts to the bridge management staff i.e. Monitoring Centre in real time for prompt action also to user's. The main objective of Bridge Monitoring System using IOT is to save the lives of the people, to protect from accident. For future work we can implement the following objectives: 1. as of now we are only focusing on the deformation monitoring of the bridge using flex sensor, by using high quality digital flex sensor we can calculate the crack at exact location in the bridge. 2. Laser technique can be used i.e. passing a laser beam at one point of bridge and receiving at another point, by implementing this technique we can detect the crack without the image processing technique. 3. By using image processing technique we can find the crack at exact location by using aerial camera or drone cameras, because the camera one which is fixed on the bridge can't capture the image of crack as the bridge tend to vibrate as the vehicle travels.

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EE8591 DIGITAL SIGNALPROCESSING L T P C
2 2 0 3

OBJECTIVES

To impart knowledge about the following topics:

- Signals and systems & their mathematical representation.
- Discrete time systems.
- Transformation techniques & their computation.
- Filters and their design for digital implementation.
- Programmability digital signal processor & quantization effects.

UNIT I INTRODUCTION 6+6

Classification of systems: Continuous, discrete, linear, causal, stability, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization,quantization error, Nyquist rate, aliasing effect.

UNIT II DISCRETE TIME SYSTEM ANALYSIS 6+6

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z- transform, application to discrete systems - Stability analysis, frequency response — Convolution – Discrete Time Fourier transform , magnitude and phase representation.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION 6+6

Discrete Fourier Transform- properties, magnitude and phase representation - Computation of DFT using FFT algorithm — DIT &DIF using radix 2 FFT — Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS 6+6

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows — Linear phase characteristics. Analog filter design — Butterworth and Chebyshev approximations; IIR Filters, digital design using impulse invariant and bilinear transformation Warping, pre warping.

UNIT V DIGITAL SIGNAL PROCESSORS 6+6

Introduction — Architecture — Features — Addressing Formats — Functional modes Introduction to Commercial DSP Processors.

TOTAL: 60 PERIODS

OUTCOMES

- Ability to understand the importance of Fourier transform, digital filters and DSProcessors.
- Ability to acquire knowledge on Signals and systems & their mathematicalrepresentation.
- Ability to understand and analyze the discrete time systems.
- Ability to analyze the transformation techniques & their computation.
- Ability to understand the types of filters and their design for digital implementation.
- Ability to acquire knowledge on programmability digital signal processor & quantizationeffects.

TEXT BOOKS:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, PHI. 2003.
2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', McGraw Hill Edu, 2013.
3. Lonnie C.Ludeman ,"Fundamentals of Digital Signal Processing",Wiley,2013

REFERENCES

1. Poorna Chandra S, Sasikala. B ,Digital Signal Processing, Vijay Nicole/TMH,2013.
2. Robert Schilling & Sandra L.Harris, Introduction to Digital Signal Processing using Matlab", Cengage Learning,2014.
3. B.P.Lathi, 'Principles of Signal Processing and Linear Systems', Oxford University Press, 2010.
4. Taan S. ElAli, 'Discrete Systems and Digital Signal Processing with Mat Lab', CRC Press, 2009.
5. SenM.kuo, woonseng…s.gan, "Digital Signal Processors, Architecture, Implementations & Applications, Pearson,2013
6. DimitrisG.Manolakis, Vinay K. Ingle, applied Digital SignalProcessing,Cambridge,2012

NPR COLLEGE OF ENGG. & TECHNOLOGY ★ NATHAM

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

Elysium Technologies®

ELYSIUM TECHNOLOGIES PRIVATE LIMITED

GST No: 33AACCE2334E1ZA
CIN No: U72200TN2006PTC060465

NASSCOM MEMBER

Date: 12.02.2021

To

The Principal,
NPR College of Engineering & Technology,
Natham.

Sir,

Sub: Permission for Internship training-reg

Ref: NPRCET/OFF/EEE/INT-03/2020-2021 dated: 08.02.2021

With reference to your letter we are pleased to grant permission for Mr. M. Deena Karthik (920818105002), Mr. M. Dinesh Kumar (920818105003), Mr. C. Manivel (920818105004), Mr. K.M. Sanjay Kishore (920818105006), of third year Electrical and Electronics Engineering of your institution to undergo Internship training in our concern from 15.02.2021 to 27.02.2021.

With Regards

(For Elysium technologies)

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

Dr. J.SUNDARARAJAN, B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

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Elysium Technologies

ELYSIUM TECHNOLOGIES PRIVATE LIMITED

GST No: 33AACCE2334E1ZA
CIN No: U72200TN2006PTC060465

NASSCOM MEMBER

Date: 27.02.2021

TO WHOMSOEVER IT MAY CONCERN

This is to certify that the students of third year EEE of NPR College of Engineering & Technology, Natham has successfully done the Internship training in our concern from 15.02.2021 to 27.02.2021.

During this period their conduct was sincere and hardworking.

S. No.	Name of the Student	Register Number	Year & Branch
1.	Mr.M.DEENA KARTHICK	920818105002	III EEE
2.	Mr.M.DINESH KUMAR	920818105003	III EEE
3.	Mr.C.MANIVEL	920818105004	III EEE
4.	Mr.K.M.SANJAY ISHORE	920818105006	III EEE

NPR COLLEGE OF ENGG & TECHNOLOGY NATHAM

Dr. J.SUNDARARAJAN,
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With Regards

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Madurai-625 020, Tamilnadu, India.

EI8073 **BIOMEDICAL INSTRUMENTATION** L T P C
3 0 0 3

OBJECTIVES

- To Introduce Fundamentals of Biomedical Engineering
- To study the communication mechanics in a biomedical system with fewexamples
- To study measurement of certain important electrical and non-electricalparameters
- To understand the basic principles in imaging techniques
- To have a basic knowledge in life assisting and therapeutic devices

UNIT I FUNDAMENTALS OF BIOMEDICAL ENGINEERING 9

Cell and its structure — Resting and Action Potential — Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems -Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues -Physiological signals and transducers - Transducers — selection criteria — Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors

UNIT II NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES 9

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements — spirometer — Photo Plethysmography, Body Plethysmography — Blood Gas analysers, pH of blood –measurement of blood pCO2, pO2, finger-tip oxymeter - ESR, GSR measurements.

UNIT III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS 9

Electrodes – Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers — Isolation amplifier - ECG — EEG — EMG — ERG — Lead systems and recordingmethods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipment.

UNIT IV IMAGING MODALITIES AND ANALYSIS 9

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems.

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES 9

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system - NanoRobots - Robotic surgery –Orthopedic prostheses fixation.

TOTAL: 45 PERIODS

OUTCOMES

At the end of the course students will have the

- Ability to understand the philosophy of the heart, lung, blood circulation and respiration system.
- Ability to provide latest ideas on devices of non-electrical devices.
- Ability to gain knowledge on various sensing and measurement devices of electrical origin.
- Ability to understand the analysis systems of various organ types.

- Ability to bring out the important and modern methods of imaging techniques and their analysis.
- Ability to explain the medical assistance/techniques, robotic and therapeutic equipments.

TEXT BOOKS:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi 2007.
2. Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, New Delhi, 2nd edition, 2003
3. Joseph J Carr and John M.Brown, Introduction to Biomedical Equipment Technology, John Wiley and sons, New York, 4th edition, 2012

REFERENCES

1. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, New York, 1998.
2. Duane Knudson, Fundamentals of Biomechanics, Springer, 2nd Edition, 2007.
3. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Health Care Systems, Technology and Techniques, Springer, 1st Edition, 2011.
4. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, Third Edition, BocaRaton, CRC Press LLC, 2006.
5. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.

AN EFFICIENT DIRECT MPPT SIMULATION FOR PV SYSTEM UNDER EXTREMELY FAST CHANGING IRRADIANCE

A MINI PROJECT REPORT

Submitted by

RAMKUMAR R

MOHAMED RIYASDEEN A

THIPAHAR P

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

ELECTRICAL AND ELECTRONICS ENGINEERING

NPR COLLEGE OF ENGINEERING AND TECHNOLOGY, NATHAM

ANNA UNIVERSITY::CHENNAI 600 025

APRIL 2021

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

104

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

ANNA UNIVERSITY::CHENNAI 600025

BONAFIDE CERTIFICATE

Certified that this mini project report **"DESIGN AND DEVELOPMENT OF INTELLIGENT SOLAR TREE BASED ON FUZZY PD PLUS I SOLAR TRACKING ALGORITHM"** is the bonafide work of **"S.ARIVUSELVAN (920818105001), M.DHEENA KARTHIK (920818105002)"** who carried out the project work under my supervision.

SIGNATURE

Mr.G.ELANGOVAN, M.E., (Ph.D).,

HEAD OF THE DEPARTMENT,

Department of Electrical and Electronics Engineering,

NPR College of Engineering and Technology,

Natham-634 401.

SIGNATURE

Mr.M.EDWIN LAWRANCE, M.E.,

SUPERVISOR,

Assistant Professor,

Department of Electrical and Electronics Engineering,

NPR College of Engineering and Technology,

Natham-634 401

Submitted for the Project viva-voce examination held on 23.04.2021

INTERNAL EXAMINER

EXTERNAL EXAMINER

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

ABSTRACT

Photovoltaic cells require of Maximum Power Point Tracking (MPPT) algorithms to ensure the amount of power extracted is maximized. True seeking, direct duty cycle control MPPT algorithms are a simple and straightforward solution that can provide high tracking efficiency. In these algorithms the duty cycle is traditionally modified to reach a new steady state prior performing a new MPPT iteration. Therefore, the MPPT update period must be larger than the converter's settling time to reach a new steady state, which limits the dynamic tracking performance. This work proposes a novel direct duty cycle control method that does not require the converter to achieve steady state in between MPPT updates. The proposed method benefits from the natural oscillations occurring in the converter to obtain extreme dynamic tracking improvements while maintaining simple implementation with no need of employing temperature or irradiance sensors. The scheme being introduced combines MPPT concepts with large-signal geometric control to achieve a reliable, high-performance solution very suitable for applications with rapidly changing irradiance such as wearable technology and rooftop EV. The proposed one validated by simulations.

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

CONCLUSION

This work introduced a simulation of novel approach for performing direct duty-cycle MPPT in photovoltaic energy harvesting applications the state-plane direct MPPT. By employing state plane analysis, the large-signal dynamic behavior of the PV connected power converter was modeled in a straightforward geometric manner. Using this geometric model, an increase in the direct MPPT algorithm updating frequency of two orders of magnitude was enabled. The much higher updating frequency resulted in extreme enhancements in the MPPT dynamic behavior.

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

EE8601 **SOLID STATE DRIVES** L T P C
3 0 0 3

OBJECTIVES:

To impart knowledge on the following Topics

- Steady state operation and transient dynamics of a motor load system.
- Analyze the operation of the converter/chopper fed dc drive, both qualitatively and quantitatively.
- Operation and performance of AC motor drives.
- Analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

UNIT I DRIVE CHARACTERISTICS 9

Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics – Selection of motor.

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE 9

Steady state analysis of the single and three phase converter fed separately excited DC motor drive– continuous conduction – Time ratio and current limit control – 4 quadrant operation of converter / chopper fed drive-Applications.

UNIT III INDUCTION MOTOR DRIVES 9

Stator voltage control–V/f control– Rotor Resistance control-qualitative treatment of slip power recovery drives-closed loop control— vector control- Applications.

UNIT IV SYNCHRONOUS MOTOR DRIVES 9

V/f control and self-control of synchronous motor: Margin angle control and power factor control-Three phase voltage/current source fed synchronous motor- Applications.

UNIT V DESIGN OF CONTROLLERS FOR DRIVES 9

Transfer function for DC motor / load and converter – closed loop control with Current and speed feedback–armature voltage control and field weakening mode – Design of controllers; current controller and speed controller- converter selection and characteristics.

OUTCOMES **TOTAL: 45 PERIODS**

- Ability to understand and suggest a converter for solid state drive.
- Ability to select suitability drive for the given application.
- Ability to study about the steady state operation and transient dynamics of a motor load system.
- Ability to analyze the operation of the converter/chopper fed dc drive.
- Ability to analyze the operation and performance of AC motor drives.
- Ability to analyze and design the current and speed controllers for a closed loop solid stateDC motor drive.

TEXT BOOKS:

1. Gopal K.Dubey, Fundamentals of Electrical Drives, Narosa Publishing House, 1992.
2. Bimal K.Bose. Modern Power Electronics and AC Drives, Pearson Education, 2002.
3. R.Krishnan, Electric Motor & Drives: Modeling, Analysis and Control, Pearson, 2001.

REFERENCES

1. Vedam Subramanyam, " Electric Drives Concepts and Applications ", 2e, McGraw Hill, 2016.
2. Shaahin Felizadeh, "Electric Machines and Drives", CRC Press (Taylor and Francis Group), 2013.
3. John Hindmarsh and Alasdain Renfrew, "Electrical Machines and Drives System," Elsevier 2012.
4. Theodore Wildi, " Electrical Machines ,Drives and power systems ,6th edition, PearsonEducation ,2015
5. N.K. De., P.K. SEN" Electric drives" PHI, 2012.

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
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Natham, Dindigul (Dt) - 624 401.

AN EFFICIENT DIRECT MPPT FOR PV SYSTEM UNDER EXTREMELY FAST CHANGING IRRADIANCE

A PROJECT REPORT

Submitted by

RAMKUMAR R

MOHAMED RIYASDEEN A

THIPAHAR P

in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

IN

ELECTRICAL AND ELECTRONICS ENGINEERING

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APRIL 2021

NATHAM

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

110

ANNA UNIVERSITY::CHENNAI 600025

BONAFIDE CERTIFICATE

Certified that this project report **"AN EFFICIENT DIRECT MPPT FOR PV SYSTEM UNDER EXTREMELY FAST CHANGING IRRADIANCE"** is the bonafide work of **"R.RAMKUMAR (920817105022), A.MOHAMED RIYASDEEN (920817105017), P.THIPAHAR (920817105027)"** who carried out the project work under my supervision.

SIGNATURE

Mr.G.ELANGOVAN, M.E., (Ph.D).,

HEAD OF THE DEPARTMENT,
Department of Electrical and
Electronics Engineering,
NPR College of Engineering and
Technology,
Natham-634 401.

SIGNATURE

Mr.M.EDWIN LAWRANCE, M.E.,

SUPERVISOR,
Assistant Professor,
Department of Electrical and
Electronics Engineering,
NPR College of Engineering and
Technology,
Natham-634 401

Submitted for the Project viva-voce examination held on 23.04.2021

INTERNAL EXAMINER

EXTERNAL EXAMINER

NPR COLLEGE OF ENGG. & TECHNOLOGY ★ NATHAM

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

ABSTRACT

Photovoltaic cells require of Maximum Power Point Tracking (MPPT) algorithms to ensure the amount of power extracted is maximized. True seeking, di- rect duty cycle control MPPT algorithms are a simple and straightforward solution that can provide high tracking efficiency. In these algorithms the duty cycle is traditionally modified to reach a new steady state prior performing a new MPPT iteration. Therefore, the MPPT update period must be larger than the converter's settling time to reach a new steady state, which limits the dynamic tracking performance. This work proposes a novel direct duty cycle control method that does not require the converter to achieve steady state in between MPPT updates. The proposed method benefits from the natural oscillations occurring in the converter to obtain extreme dynamic tracking improvements while maintaining simple implementation with no need of employing temperature or irradiance sensors. The scheme being introduced combines MPPT concepts with large-signal geometric control to achieve a reliable, high-performance solution very suitable for applications with rapidly changing irradiance such as wearable technology and rooftop EV. The proposed one validated by simulations and experimental results.

Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
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CHAPTER 6
CONCLUSION & FUTURE WORK

6.1 CONCLUSION

This work introduced a novel approach for performing direct duty-cycle MPPT in photovoltaic energy harvesting applications: the State-plane direct MPPT. By employing state plane analysis, the large-signal dynamic behaviour of the PV connected power converter was modelled in a straightforward geometric manner. Using this geometric model, an increase in the direct MPPT algorithm updating frequency of two orders of magnitude was enabled. The much higher updating frequency resulted in extreme enhancements in the MPPT dynamic behavior.

6.2 FUTURE WORK

- In future, we will propose a SA (simulated annealing) optimized direct duty cycle control method that does not require the converter to achieve steady state in between MPPT updates.
- The scheme being introduced combines MPPT concepts with Dynamic PV array (DPVA) approach for extracting maximum power from PV array control to achieve a reliable, high-performance solution.

Dr. J.SUNDARARAJAN,
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EE8691 EMBEDDED SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

To impart knowledge on the following Topics

- Building Blocks of Embedded System
- Various Embedded Development Strategies
- Bus Communication in processors, Input/output interfacing.
- Various processor scheduling algorithms.
- Basics of Real time operating system and example tutorials to discuss on one real time operating system tool.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to Embedded Systems –Structural units in Embedded processor , selection of processor & memory devices- DMA — Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

UNIT II EMBEDDED NETWORKING 9

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols RS232 standard – RS422 – RS 485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I^2C) –need for device drivers.

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT 9

Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication — synchronization between processes- semaphores, Mailbox, pipes, priority inversion, priority inheritance.

UNIT V EMBEDDED SYSTEM APPLICATION AND DEVELOPMENT 9

Case Study of Washing Machine- Automotive Application- Smart card System Application-ATM machine –Digital camera

TOTAL: 45 PERIODS

OUTCOMES

- Ability to understand and analyze Embedded systems.
- Ability to suggest an embedded system for a given application.
- Ability to operate various Embedded Development Strategies
- Ability to study about the bus Communication in processors.
- Ability to acquire knowledge on various processor scheduling algorithms.
- Ability to understand basics of Real time operating system.

TEXT BOOKS:

1. Peckol, "Embedded system Design", John Wiley & Sons,2010
2. Lyla B Das," Embedded Systems-An Integrated Approach", Pearson, 2013
3. Shibu. K.V, "Introduction to Embedded Systems", 2e, Mc graw Hill, 2017.

REFERENCES

1. Raj Kamal, 'Embedded System-Architecture, Programming, Design', Mc Graw Hill, 2013.
2. C.R.Sarma, "Embedded Systems Engineering", University Press (India) Pvt. Ltd, 2013.
3. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006.
4. Han-Way Huang, "Embedded system Design Using C8051", Cengage Learning, 2009.
5. Rajib Mall "Real-Time systems Theory and Practice" Pearson Education, 2007.

NATHAM

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Principal
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Natham, Dindigul (Dt) - 624 401.

megatronics

Date: 05.03.2021

To

The Principal,

NPR College of Engineering & Technology,

Natham.

Dear Sir,

Sub: Permission for Internship-reg

Ref: NPRCET/OFF/EEE/INT-04/2020-2021 dated: 01-03-2021.

With reference to your letter cited above, we are pleased to give permission for Mr. KARTHIKEYAN R (920819105004), Mr. PRADAPKANNAN B (920819105011), Mr. SUJEETHRAN S (920819105014) of Second year Electrical and Electronics Engineering of your institution to undergo Internship Training in our organization from 08.03.2021 to 20.03.2021.

Thank you.

For Megatronics

(C.Kalidass)

Megatronics
65, R.K. Mills "B" Colony, Peelamedu Pudur, Coimbatore - 641 004.
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Web : www.megatronicsindia.in

NPR COLLEGE OF ENGG. & TECHNOLOGY NATHAM

Dr. J.SUNDARARAJAN,
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Principal
N.P.R. College of Engineering & Technology
Natham, Dindigul (Dt) - 624 401.

megatronics

Date: 20-03-2021

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. KARTHIKEYAN R (920819105004)** doing Second year B.E, Electrical and Electronics Engineering in NPR College of Engineering & Technology, Natham has undergone the Internship training program offered by our organization during the period of 08.03.2021 - 20.03.2021.

We wish her every success in life.

For Megatronics

(C Kabilan)

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Cell : 98422-65001 Phone : 0422 - 256 5001 E-mail : megatronicsindia@gmail.com
Web : www.megatronicsindia.in

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Dr. J.SUNDARARAJAN,
B.E., M.Tech., Ph.D.,
Principal
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megatronics

Date: 20-03-2021

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. PRADAPKANNAN B (920819105011)** doing Second year B.E, Electrical and Electronics Engineering in NPR College of Engineering & Technology, Natham has undergone the Internship training program offered by our organization during the period of 08.03.2021 - 20.03.2021.

We wish her every success in life.

For Megatronics,

(C Kannan)

Megatronics
65, R.K. Mills 'B' Colony, Peelamedu Pudur, Coimbatore - 641 004.
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Dr. J.SUNDARARAJAN,
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Principal
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Date: 20-03-2021

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. SUJEETHRAN S (920819105014)** doing Second year B.E, Electrical and Electronics Engineering in NPR College of Engineering & Technology, Natham has undergone the Internship training program offered by our organization during the period of 08.03.2021 - 20.03.2021.

We wish her every success in life.

For Megatronics

(C Kalidass)

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NPR COLLEGE OF ENGG & TECHNOLOGY NATHAM

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Natham, Dindigul (Dt) - 624 401.

EE8004 MODERN POWER CONVERTERS L T P C
3 0 0 3

OBJECTIVES:

To impart knowledge about the following topics:

- Switched mode power supplies
- Matrix Converter
- Soft switched converters

UNIT I SWITCHED MODE POWER SUPPLIES (SMPS) 9

DC Power supplies and Classification; Switched mode dc power supplies - with and without isolation, single and multiple outputs; Closed loop control and regulation; Design examples on converter and closed loop performance.

UNIT II AC-DC CONVERTERS 9

Switched mode AC-DC converters. synchronous rectification - single and three phase topologies - switching techniques - high input power factor . reduced input current harmonic distortion. improved efficiency. with and without input-output isolation. performance indices design examples

UNIT III DC-AC CONVERTERS 9

Multi-level Inversion - concept, classification of multilevel inverters, Principle of operation, main features and analysis of Diode clamped, Flying capacitor and cascaded multilevel inverters; Modulation schemes.

UNIT IV AC-AC CONVERTERS WITH AND WITHOUT DC LINK 9

Matrix converters. Basic topology of matrix converter; Commutation — current path; Modulation techniques - scalar modulation, indirect modulation; Matrix converter as only AC - DC converter; AC-AC converter with DC link - topologies and operation - with and without resonance link - converter with dc link converter; Performance comparison with matrix converter with DC link converters.

UNIT V SOFT-SWITCHING POWER CONVERTERS 9

Soft switching techniques. ZVS, ZCS, quasi resonance operation; Performance comparison hard switched and soft switched converters.AC-DC converter, DC-DC converter, DC-AC converter.; Resonant DC power supplies .

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to suggest converters for AC-DC conversion and SMPS

TEXT BOOKS:

1. Power Electronics Handbook, M.H.Rashid, Academic press, New york, 2000.
2. Advanced DC/DC Converters, Fang Lin Luo and Fang Lin Luo, CRC Press,NewYork, 2004.
3. Control in Power Electronics- Selected Problem, Marian P.Kazmierkowski, R.Krishnan and Frede Blaabjerg, Academic Press (Elsevier Science), 2002.

REFERENCES

1. Power Electronic Circuits, Issa Batarseh, John Wiley and Sons, Inc.2004
2. Power Electronics for Modern Wind Turbines, Frede Blaabjerg and Zhe Chen, Morgan & Claypool Publishers series, United States of America, 2006.
3. Krein Philip T, Elements of Power Electronics,Oxford University press, 2008

4. Agarwal ,Power Electronics: Converters, Applications, and Design, 3rd edition, Jai P, Prentice Hall,2000
5. L. Umanand, Power Electronics: Essentials & Applications, John Wiley and Sons,2009.

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DESIGNAND DEVELOPMENT OF INTELLIGENT SOLAR TREE BASED ON FUZZY PD PLUS I SOLAR TRACKING ALGORITHM

A MINI PROJECT REPORT

Submitted by

ARIVUSELVAN S

DHEENA KARTHIK M

in partial fulfillment for the award of the degree

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IN

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BONAFIDE CERTIFICATE

Certified that this mini project report **"AN EFFICIENT DIRECT MPPT SIMULATION FOR PV SYSTEM UNDER EXTREMELY FAST CHANGING IRRADIANCE"** is the bonafide work of **"R.RAMKUMAR (920817105022), A.MOHAMED RIYASDEEN (920817105017), P.THIPAHAR (920817105027)"** who carried out the project work under my supervision.

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ABSTRACT

Scarcity of availing energy is certainly minimizing due to the uncontrollable usage of electricity. In order to overcome this situation, power generations are moving on to the non-conventional or renewable side. In India, Solar energy is considered as greatest resource of generating electricity, which is unrestricted, infinite, non-polluting, ecological and frequent source of energy. The project explains astral control tree that generate vast quantity of liveliness by occupying very small space. It can also utilize the "SPIRALLING PHYLLATAXY" to increase the efficiency, which is much better than usual or traditional or normal Solar PV system in occupancy point of view and highly efficient. The theme of the project is to design and develop the intelligent solar tree to grasp the maximum solar power from the sun using Fuzzy PD plus I solar tracking algorithm.

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CONCLUSION

The main motive of the project is to increase the efficiency of the power consumption by placing the solar panels in the vertical axis i.e., in solar tree pattern. The difficulty of horizontal tracking solar system is dominantly eliminated by the vertical tracking solar system. Through the vertical axis manner, the consumption of landmass is getting reduced and the intensity of light radiation is huge in capacity. The mechatronics model helps as to control the rotation of solar panel and its movement. Fuzzy PD plus I is a controlling mechanism which helps in various domains and practical application. In similar way, the solar panel movement is get controlled by Fuzzy.

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PH8253 PHYSICS FOR ELECTRONICS ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To understand the essential principles of Physics of semiconductor device and Electron transport properties. Become proficient in magnetic, dielectric and optical properties of materials and nano devices.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential: Bloch thorem – metals and insulators - Energy bands in solids– tight binding approximation - Electron effective mass – concept of hole.

UNIT II SEMICONDUCTOR PHYSICS 9

Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Carrier transport: Velocity-electric field relations – drift and diffusion transport - Einstein's relation – Hall effect and devices – Zener and avalanche breakdown in p-n junctions - Ohmic contacts – tunnel diode - Schottky diode – MOS capacitor - power transistor.

UNIT III MAGNETIC AND DIELECTRIC PROPERTIES OF MATERIALS 9

Magnetism in materials – magnetic field and induction – magnetization - magnetic permeability and susceptibility–types of magnetic materials – microscopic classification of magnetic materials - Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory. Dielectric materials: Polarization processes – dielectric loss – internal field – Clausius-Mosotti relation- dielectric breakdown – high-k dielectrics.

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and Semiconductors (concepts only) - photo current in a P- N diode – solar cell –photo detectors - LED – Organic LED – Laser diodes – excitons - quantum confined Stark effect – quantum dot laser.

UNIT V NANOELECTRONIC DEVICES 9

Introduction - electron density in bulk material – Size dependence of Fermi energy– quantum confinement – quantum structures - Density of states in quantum well, quantum wire and quantum dot structures –Zener-Bloch oscillations — resonant tunneling — quantum interference effects — mesoscopic structures: conductance fluctuations and coherent transport – Coulomb blockade effects - Single electron phenomena and Single electron Transistor – magnetic semiconductors– spintronics - Carbon nanotubes: Properties and applications.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the students will able to

- gain knowledge on classical and quantum electron theories, and energy band structuues,
- acquire knowledge on basics of semiconductor physics and its applications in various devices,
- get knowledge on magnetic and dielectric properties of materials,

- have the necessary understanding on the functioning of optical materials for optoelectronics,
- understand the basics of quantum structures and their applications in spintronics and carbon electronics.

TEXT BOOKS:

1. Kasap, S.O. "Principles of Electronic Materials and Devices", McGraw-Hill Education, 2007.
2. Umesh K Mishra & Jasprit Singh, "Semiconductor Device Physics and Design", Springer, 2008.
3. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials". Narosa Publishing House, 2009.

REFERENCES

1. Garcia, N. & Damask, A. "Physics for Computer Science Students". Springer-Verlag, 2012.
2. Hanson, G.W. "Fundamentals of Nanoelectronics". Pearson Education, 2009
3. Rogers, B., Adams, J. & Pennathur, S. "Nanotechnology: UnderstandingSmall Systems". CRC Press, 2014

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POWER MANGEMENT STORAGE THROUGH LOCAL CONSUMER DEMAND CONTROL USING IOT

A MINI PROJECT REPORT

Submitted by

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ABSTRACT

The power management scheme implemented in micro grid system. Internet of Things (IOT) with electronic microcontroller is used to overcome the electricity demand. Let the fastest growing of the electronic devices and that elements load need an entire electricity demand. The proper preposition method is also one of the possible solutions to control the energy demand by using an IOT (Internet of Things). This project describes the smart energy management system using IOT Based system consumer load management .Grid based applications integrated with EV application. Consumer based service implemented with grid applications integrated IOT system for analysis the demand of the system.

CONCLUSION

In this project we represented the installed technique of 480 Ah of batteries, In, solar 1320Wp of photovoltaic panels, In wind 300Wp and DC generator of 90Wp, were given a monthly saving power 160 to 230kwh. The whole lighting and computer system are completely self-governing. The presented device is provided as a pretty easy and elongated the idea of a self-governing system. It makes the irregular activity of utilization by electrical network and appearing as a unique to the other variety of close by renewable generation. In a energy storage system the end-user person can be expand the idea of centralized storage is monitored and controlled. By means of a community server, and is absolutely included to Smart Grid environment system.

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BE8252 BASIC CIVIL AND MECHANICAL ENGINEERING L T P C
4 0 0 4

OBJECTIVES:

- To impart basic knowledge on Civil and Mechanical Engineering.
- To familiarize the materials and measurements used in Civil Engineering.
- To provide the exposure on the fundamental elements of civil engineering structures.
- To enable the students to distinguish the components and working principle of powerplant units, IC engines, and R & AC system.

A – OVER VIEW

UNIT I SCOPE OF CIVIL AND MECHANICAL ENGINEERING 10

Overview of Civil Engineering - Civil Engineering contributions to the welfare of Society — Specialized sub disciplines in Civil Engineering — Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering

Overview of Mechanical Engineering - Mechanical Engineering contributions to the welfare of Society –Specialized sub disciplines in Mechanical Engineering - Production, Automobile, Energy Engineering - Interdisciplinary concepts in Civil and Mechanical Engineering.

B – CIVIL ENGINEERING

UNIT IISURVEYING AND CIVIL ENGINEERING MATERIALS 10

Surveying: Objects – classification – principles – measurements of distances – angles – leveling – determination of areas– contours - examples.

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel - timber - modern materials

UNIT III BUILDING COMPONENTS AND STRUCTURES 15

Foundations: Types of foundations - Bearing capacity and settlement — Requirement of good foundations.

Civil Engineering Structures: Brickmasonry – stonemasonry – beams – columns – lintels – roofing – flooring – plastering – floor area, carpet area and floor space index - Types of Bridges and Dams – water supply - sources and quality of water - Rain water harvesting - introduction to high way and rail way.

C – MECHANICAL ENGINEERING

UNIT IV INTERNAL COMBUSTION ENGINES AND POWER PLANTS 15

Classification of Power Plants - Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines — Four stroke and two stroke cycles — Comparison of four stroke and two stroke engines — Working principle of steam, Gas, Diesel, Hydro - electric and Nuclear Power plants — working principle of Boilers, Turbines, Reciprocating Pumps (single acting and double acting) and Centrifugal Pumps

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 10

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner.

TOTAL: 60 PERIODS

OUTCOMES

On successful completion of this course, the student will be able to

- Appreciate the Civil and Mechanical Engineering components of Projects.
- Explain the usage of construction material and proper selection of construction materials.
- Measure distances and area by surveying
- Identify the components used in power plant cycle.
- Demonstrate working principles of petrol and diesel engine.
- Elaborate the components of refrigeration and Air conditioning cycle.

TEXTBOOKS:

1. Shanmugam Gand Palanichamy MS,"Basic Civil and Mechanical Engineering",Tata McGrawHill PublishingCo.,NewDelhi,1996.

REFERENCES:

1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2010.
2. Ramamrutham S.,"Basic Civil Engineering", Dhanpat Rai Publishing Co.(P) Ltd.1999.
3. Seetharaman S.,"BasicCivil Engineering",AnuradhaAgencies,2005.
4. ShanthaKumar SRJ.,"Basic Mechanical Engineering", Hi-tech Publications, Mayiladuthurai, 2000.

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MULTI-RATE SIMULATION OF LARGE SCALED POWER ELECTRONICS SYSTEMS USING SIMUPEC® ON MATLAB SIMULINK

A MINI PROJECT REPORT

Submitted by

MONIKA V

SANJAY KISHORE K M

in partial fulfillment for the award of the degree

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BONAFIDE CERTIFICATE

Certified that this mini project report **"MULTI-RATE SIMULATION OF LARGE SCALED POWER ELECTRONICS SYSTEM USING SIMUPEC® ON MATLAB SIMULINK"** is the bonafide work of **"V.MONIKA (920818105005), K.M.SANJAY KISHORE (920818105006)"** who carried out the project work under my supervision.

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ABSTRACT

This project describes a new modelling and simulation method for the simulation of large scaled power electronics systems containing thousands of switching devices, thermal and electromechanical devices. The whole power electronics system will be divided into many small subsystems each has its own subsystem matrix. They each are simulated with different time steps according to their requirements of accuracy. This technique allows significant speed improvement compared to modelling the complete power electronics system in one large system matrix and single time step Simulators. In addition it makes the system easy to formulate and program. A comparison between MMC-201-Level converters modelled as switching model (detailed model) using circuit partitioning with an average model using switching function and average capacitor voltage is also presented. The modelling and simulation of a relatively complex power electronics system; a radial three terminals MMC-201-Level converter containing three MMC-201-Level converter stations and six DC-cables will be discussed.

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CONCLUSION

The project has discussed a new modelling and simulation method for the simulation of large scaled power electronics systems containing thousands of switching devices, components, thermal, electromechanical and control systems in the Matlab/Simulink® environment. The project emphasis the modelling and simulation using circuit partitioning and decoupling; a powerful feature which enables you to divide large scaled power electronics system (large system matrix) into many small systems (many small matrices) which can each be modeled as separate S-functions having their own multi-rate factors MRF. The new large time step of the S-function block is a multiplication of the system fixed step of Simulink with multi-rate factor MRF. The modelling and simulation of a relatively complex power electronics system; a radial three terminals MMC-201-Level converter containing three MMC-201-Level converter stations and 6 DC-cables has been presented

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EE8251 CIRCUIT THEORY L T P C
2 2 0 3

OBJECTIVES:

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuit equations using network theorems
- To introduce the phenomenon of resonance in coupled circuits.
- To educate on obtaining the transient response of circuits.
- To introduce Phasor diagrams and analysis of three phase circuits

UNIT I BASIC CIRCUITS ANALYSIS 6+6

Resistive elements - Ohm's Law Resistors in series and parallel circuits – Kirchoffs laws – Meshcurrent and node voltage - methods of analysis.

UNIT II NETWORK REDUCTION AND THEOREMS FOR DC AND AC IRCUITS 6+6

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNIT III TRANSIENT RESPONSE ANALYSIS 6+6

L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input.

UNIT IV THREE PHASE CIRCUITS 6+6

A.C. circuits — Average and RMS value - Phasor Diagram — Power, Power Factor and Energy.- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power measurement in three phase circuits.

UNIT V RESONANCE AND COUPLED CIRCUITS 6+6

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Selfand mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

TOTAL: 60 PERIODS

OUTCOMES

- Ability to analyse electrical circuits
- Ability to apply circuit theorems
- Ability to analyse transients

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering CircuitsAnalysis", McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits",Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

REFERENCES

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, NewDelhi, 1999.
2. Jegatheesan, R., "Analysis of Electric Circuits," McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, McGraw-Hill, New Delhi, 2010.
4. M E Van Valkenburg, "Network Analysis",Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
5. Mahadevan, K., Chitra, C., "Electric Circuits Analysis," Prentice-Hall of India Pvt Ltd., New Delhi, 2015.
6. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley & Sons, Inc. 2015.
7. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis",McGraw Hill, 2015.

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A ROBUST ANALYTIC MODEL OF FOLDED FIN COLD PLATES FOR AUTOMOTIVE POWER ELECTRONICS COOLING

A MINI PROJECT REPORT

Submitted by

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in partial fulfillment for the award of the degree

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ABSTRACT

The development of high power density automotive power electronics led to newer, and often more costly, cooling solutions in pursuit of maintaining desirable operating temperatures. This has been followed by a shift of focus from proving new technologies to producing low-cost electric and hybrid-electric vehicles accessible to more customers, resulting in renewed interest in low-cost solutions to power electronics cooling. Folded fins are one such solution, common on mass produced heat exchangers, and have been applied in legacy power electronics cooling systems. This paper presents an analytic model that allows for an expedient, robust, and accurate thermal analysis of a folded fin cold plate. The model combines empirical and algebraic approaches to capture heat transfer effects in a 3-dimensional, multi-phase domain including the transistor, cold plate, and coolant. In practice, computational analysis is often used in place of empirical and mathematical methods. The methods described here have the advantages of allowing for broader and more efficient trade studies due to vastly shorter solution times and providing junction temperature estimates within 5 °C of computational methods, and therefore complement computational methods. Lastly, use of the model to design a cold plate for an insulated-gate bipolar transistor cooling system in a hybrid electric vehicle is described. The model is used to explore manufacturability constraints, fouling criteria, assembly methods, fin types, and materials of construction. The result is a design that provides a comparable operating junction temperature in the IGBTs with a significant cost reduction compared to a more exotic legacy design.

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CONCLUSION

The model presented is specific to three types of folded fin cold plate design. However, the model can be expanded to other types of folded fins if empirical flow correlations are available. For cold plate designs that don't use folded fins, most of the methods described are still applicable and would be useful for design work. This work demonstrates the potential of low-cost fin solutions, particularly the folded fin, to provide thermal performance comparable to more expensive designs. Despite a significantly higher convective heat transfer coefficient, a proprietary design currently in use does not provide significant reduction in junction temperature due to dominance of other thermal resistances, such as the junction-to-case thermal resistance of the IGBT package and the thermal resistance of the TIM

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EE8811 PROJECT WORK **L T P C**

0 0 20 10

OBJECTIVES:

• To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 300 PERIODS

OUTCOMES:

• On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

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ENERGY CONSERVATION IN STREET LAMP BY RFID

A PROJECT REPORT

Submitted by

SABARISH R

in partial fulfillment for the award of the degree

of

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Technology.
Natham-634 401

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INTERNAL EXAMINER

EXTERNAL EXAMINER

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ABSTRACT

In this project, the new technology of RDIF (Radio Frequency Identification) has been used in order to identify vehicles and also 3 significant parameters including the average speed of vehicles at any side of access point, the average time for waiting and the queue length. They have been used based on the data from neural network for making the best decision throughout the process of finding out duration of the cycle and percentage of green time for each of the access point. Implementation of this system is possible in the shortest time and it has a better function in any kind of weather condition, time or place compared to similar systems.

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CHAPTER 6

CONCLUSION

6.1 CONCLUSION

This project concludes that the electric energy can be saved by means of reading the RFID tags when there is Usage of roads in night time by vehicles and we can conserve the electric energy in the range of KW/hr and in future we can extend this project by setuping solar panel nearby road side to supply power to the street light.

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