NATIONAL ENGINEERING COLLEGE

(An Autonomous Institution – Affiliated to Anna University Chennai)

K.R.NAGAR, KOVILPATTI – 628 503

www.nec.edu.in

REGULATIONS - 2015

SYLLABUS

for

ONE CREDIT ELECTIVE COURSES

(UG DEGREE PROGRAMMES)

B.E. - MECHANICAL ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING
ONE CREDIT ELECTIVE COURSES (PEC)

S. No	Course Category	Course Code	COURSE TITLE	L	T	P	C	QP
Thermal Engineering Domain								
1.	PEC	15ME01L	Shell and Tube Heat Exchanger Design	1	0	0	1	G
2.	PEC	15ME02L	Energy Audit and Management	1	0	0	1	G
3.	PEC	15ME03L	Pyrolysis and Gasification	1	0	0	1	G
4.	PEC	15ME04L	Heat Transfer Enhancement	1	0	0	1	G
5.	PEC	15ME05L	Grid Tied PV System Design	1	0	0	1	G
6.	PEC	15ME06L	Off Grid PV System Design	1	0	0	1	G
7.	PEC	15ME07L	Thermal Energy Storage Systems	1	0	0	1	G
8.	PEC	15ME08L	Solar Thermal Steam Generation Systems	1	0	0	1	G
9.	PEC	15ME09L	Solar Cooling Systems	1	0	0	1	G
10.	PEC	15ME10L	Desalination					
Design Engineering Domain								
11.	PEC	15ME11L	Industrial Drawing Reading with GD&T	1	0	0	1	G
12.	PEC	15ME12L	Process Equipment Design	1	0	0	1	G
13.	PEC	15ME13L	Techniques for Vibration monitoring and controls	1	0	0	1	G
14.	PEC	15ME14L	Crashworthiness of Tubular Shells	1	0	0	1	G
15.	PEC	15ME15L	Failure mode and effects Analysis	1	0	0	1	G
16.	PEC	15ME16L	Design of Experiments	1	0	0	1	G
17.	PEC	15ME17L	Taguchi Methods	1	0	0	1	G
Manufacturing and Industrial Engineering Domain								
18.	PEC	15ME18L	Natural Fiber Composites	1	0	0	1	G
19.	PEC	15ME19L	Optimization in Scheduling	1	0	0	1	G
20.	PEC	15ME20L	Functional Materials for Energy Conversion	1	0	0	1	G
21.	PEC	15ME21L	Design for Manufacturability	1	0	0	1	G
22.	PEC	15ME22L	Project Management	1	0	0	1	G

15ME01L SHELL AND TUBE HEAT EXCHANGER DESIGN

L	T	P	C
1	0	0	1

COURSE OUTCOMES

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

CO1: Conceive a design based on the information provided for a specific application (K4).

CO2: Determine the size of heat exchanger for a given requirement (K4).

Types of heat exchangers, shell and tube heat exchangers – regenerators and recuperators – Parts description, classification as per Tubular Exchanger Manufacturers Association.

Kern method – Bell Delware method – classification of baffles – flow induced vibrations-Demo about HTRI Suite Software.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Kuppan T, “Heat Exchanger Design handbook”, 2nd Edition, CRC Press, 2013.
2. Sadik Kakac and Hongtan Liu, "Heat Exchangers Selection, Rating and Thermal Design”, CRC Press, 2012.

15ME02L	ENERGY AUDIT AND MANAGEMENT	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Play the role of energy manager in an industry (K4).

CO2: Develop methodology to carry out energy audit and management of equipment and processes (K4).

Energy Scenario – Energy monitoring, auditing & targeting – Economics of various Energy Conservation schemes. Total Energy Systems.

Steam engineering – Conservation Measures in Steam; Boilers – types, losses and efficiency calculation methods.

Refrigeration and Air conditioning – Heat load estimation – Energy conservation in cooling towers and spray ponds.

Energy conservation in Centrifugal pumps, Fans & Blowers, Air compressor – energy consumption and energy saving potentials.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Frank Kreith, Yogi Goswami D, “Energy Management and Conservation Handbook”, 2nd Edition, CRC Press, 2016.
2. Tarik Al-Shemmeri, “A Workbook for Energy Management in Buildings”, John Wiley & Sons, 2011.
3. Penni McLean-Conner, “Energy Efficiency: Principles and Practices”, Penn Well Books, 2009.
4. Barney L Capehart, Wayne C Turner, William J Kennedy, “Guide to Energy Management”, The Fairmont Press, Inc., 2008.
5. Eastop T D, Croft D R, “Energy Efficiency for Engineers and Technologists”, Logman Scientific & Technical, 1990.
6. Reay D A, “Industrial Energy Conservation”, 1st Edition, Pergamon Press, 1979.
7. Bureau of Energy Efficiency Books, Volumes I-IV.

15ME03L	PYROLYSIS AND GASIFICATION	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Develop a simple design for pyrolysis and gasification process (K4).

Pyrolysis: Introduction – Types of pyrolysis – pyrolysis products – kinectics. Pyrolzer types – simple design.

Gasification: Gasifier Reactions and steps – gasification process – types of gasifiers: Fixed bed, fluidized bed and Simple process design.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Yongseung Yun, “Gasification for Practical Applications”, InTech, 2012.
2. Prabir Basu, “Biomass Gasification and Pyrolysis Practical Design and Theory”, Academic Press, Elsevier, 2010.
3. Jean – Pierre, “Biomass gasification: chemistry, Processes and applications”, Nova Science Publishers, UK, 2009.
4. Christopher Higman, “Gasification”, 2nd Edition, Gulf professional, Elsevier, 2008.
5. Berlin A A, “Chemical Physics of Pyrolysis, Combustion, and Oxidation”, Nova Publishers, 2005.

15ME04L	HEAT TRANSFER ENHANCEMENT	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Analyze and apply different heat transfer enhancement techniques (K4).

CO2: Analyze the influence of nano-materials for heat transfer augmentation (K4).

Need for heat transfer enhancement – Types of heat transfer enhancements – Heat transfer associated with internal flows – Application of Nanomaterials in Heat Transfer – Nanofluids – Mechanism of Heat Transfer Augmentation using Nanofluids - Heat transfer associated with external flows – Optimization of Heat Transfer Enhancement – Case Studies on the Heat Transfer Augmentation.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Theodore L Bergman, Frank P Incropera, David P DeWitt, Adrienne S Lavine, “Fundamentals of Heat and Mass Transfer”, John Wiley & Sons, 2011.
2. James P Hartnett, “Advances in Heat Transfer”, Vol. 36, Academic Press, 2002.
3. Fan J F, Ding W K, Zhang J F and He Y L, Tao W Q, “A performance evaluation plot of enhanced heat transfer techniques oriented for Energy-Saving”, International Journal of Heat and Mass Transfer, vol. 52(2009), pp. 33–44.
4. Mourad Rebay, Sadik Kakaç, Renato M Cotta, “Microscale and Nanoscale Heat Transfer: Analysis, Design, and Application”, CRC Press, 2016.
5. Ashutosh Tiwari, Yogendra Kumar Mishra, Hisatoshi Kobayashi, Anthony P F Turner, “Intelligent Nanomaterials”, 2nd edition , John Wiley & Sons, 2016.
6. Vincenzo Bianco, Oronzio Manca, Sergio Nardini, Kambiz Vafai, “Heat Transfer Enhancement with Nanofluids”, CRC Press, 2015.
7. Sarit K Das, Stephen U Choi, Wenhua Yu, Pradeep T, “Nanofluids: Science and Technology”, 2008.
8. Visinee Trisaksria, Somchai Wongwises, “Critical review of heat transfer characteristics of nanofluids”, Renewable and Sustainable Energy Reviews, vol. 11(3)-2007, pp. 512–523.
9. Sadik, Anchasa P, “Review of convective heat transfer enhancement with nanofluids”, International Journal of Heat and Mass Transfer, vol. 52 (2009), pp.3187–3196.
10. https://www.journals.elsevier.com/international-journal-of-heat-and-fluid-flow/
11. https://www.journals.elsevier.com/international-journal-of-heat-and-mass-transfer/
12. http://www.sciencedirect.com/science/journal/00179310/53/21-22.

15ME05L	GRID TIED PV SYSTEM DESIGN	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Design the grid tied PV system for small power applications (K3).

CO2: Predict and evaluate the performance of grid tied PV systems (K4).

Meteorological aspects – Shading analysis – System components - Grid tied PV system configuration – Design methodology of PV system – PV array design – Balance of systems – Net metering– PV system design for small & medium power applications – Remote monitoring – Performance prediction using PVsyst – Field study – Performance evaluation.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Suneel Deambi, “Photovoltaic System Design: Procedures, Tools and Applications”, CRC Press, 2016.
2. Chetan Singh Solanki, “Solar Photovoltaic Technology and Systems: a manual for technicians, trainers and Engineers”, Prentice Hall of India, 2014.
3. John R Balfour, Michael Shaw, “Advanced Photovoltaic System Design”, Jones & Bartlett Publishers, 2011.
4. Roger Messenger, Amir Abtahi, “Photovoltaic Systems Engineering”, 3rd Edition, CRC Press, 2010.
5. Web sources : www.pveducation.org; www.pveducation.com; nptel.ac.in/courses/108105058/17

15ME06L	OFF GRID PV SYSTEM DESIGN	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Design the standalone PV system for residential buildings (K3).

CO2: Predict and evaluate the performance of stand-alone PV systems (K4).

Meteorological aspects – Shading analysis - Solar PV module-PV array-selection of batteries for PV system - charge controller-standalone PV system configuration- with battery, AC and DC loads-Design methodology of PV system- Applications - Estimation of residential building load –design of standalone system - Performance prediction and evaluation using software.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Suneel Deambi, “Photovoltaic System Design: Procedures, Tools and Applications”, CRC Press, 2016.
2. Parimita Mohanty, Tariq Muneer, Mohan Kolhe, “Solar Photovoltaic System Applications: A Guidebook for Off-Grid Electrification”, Springer, 2015.
3. Chetan Singh Solanki, “Solar Photovoltaic Technology and Systems: a manual for technicians, trainers and Engineers”, Prentice Hall of India, 2014.
4. Chetan Singh Solanki, “Solar Photovoltaics Fundamentals, Technologies and Applications”, 2nd edition, Prentice Hall of India, 2012.
5. John R Balfour, Michael Shaw, “Advanced Photovoltaic System Design”, Jones & Bartlett Publishers, 2011.
6. Roger Messenger, Amir Abtahi, “Photovoltaic Systems Engineering”, 3rd edition, CRC Press, 2010.

15ME07L	THERMAL ENERGY STORAGE SYSTEMS	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Choose suitable energy storage technology for given application (K4).

Different energy storage technologies - phase change and sensible energy storage materials – materials for different temperature applications – design considerations – charging and discharging characteristics – performance.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Shannaq R Al and Barreneche C, “Advances in Thermal Energy Storage Systems- Methods and Applications”, A volume in Woodhead Publishing Series in Energy, 2015.
2. Cabeza Luisa F, “Advances in Thermal Energy Storage Systems: Methods and Applications”, Elsevier, 2014.
3. Kalaiselvam S, Parameshwaran R, “Thermal Energy Storage Technologies for Sustainability: Systems Design, Assessment and Applications”, Elsevier, 2014.
4. Ibrahim Dincer and Marc A Rosen, “Thermal Energy Storage: Systems and Applications”, 2nd edition, John Wiley & Sons, Ltd., 2011.
5. Nasiru I Ibrahim et al., “Heat transfer enhancement of phase change materials for thermal energy storage applications: A critical review”, Renewable and Sustainable Energy Reviews, vol. 74 (2017) 26–50.
6. Belen Zalba et al., “Review on thermal energy storage with phase change: materials, heat transfer analysis and applications”, Applied Thermal Engineering, vol. 23 (2003), pp. 251–283.

15ME08L	SOLAR THERMAL STEAM GENERATION SYSTEMS	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Choose appropriate solar steam generation system for given application (K4).

Solar Concentrated Collectors generation technologies, direct and indirect steam generation system, flash evaporation, Concentrating solar collectors, solar steam generation using different type of collectors, power tower, energy storage, design considerations and performance, applications and economics.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Manuel Blanco, Lourdes Ramirez Santigosa, “Advances in Concentrating Solar Thermal Research and Technology”, Woodhead Publishing, 2016.
2. Soteris A Kalogirou, “Solar Energy Engineering: Processes and Systems”, 2nd edition, Acadamic Press, Elsevier Inc., 2014.
3. Lovegrove K, Stein W, “Concentrating Solar Power Technology: Principles, Developments and Applications”, Elsevier, 2012.
4. Soteris A Kalogirou, “Solar thermal collectors and applications”, Progress in Energy and Combustion Science, vol. 30 (2004), pp. 231–295.

15ME09L	SOLAR COOLING SYSTEMS	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Choose appropriate solar cooling system for given application (K4).

Different solar cooling technologies, integrating vapour compression systems and vapour absorption systems, desiccants, energy storage requirements, design considerations, economy and applications.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Ioan Sarbu, Calin Sebarchievici, “Solar Heating and Cooling Systems: Fundamentals, Experiments and Applications”, Academic Press, 2016.
2. Ruzhu Wang, Tianshu Ge, “Advances in Solar Heating and Cooling”, Woodhead Publishing, 2016.
3. Paul Kohlenbach and UliJakob, “Solar Cooling: The Earthscan Expert Guide to Solar Cooling Systems”, Routledge, England, 2014.
4. Garg H P, Prakash J, “Solar Energy: Fundamentals and Applications”, Tata McGraw-Hill Education, 2000.
5. Mehdi Zeyghami, Yogi Goswami D, Elias Stefanakos, “A review of solar thermo-mechanical refrigeration and cooling methods”, Renewable and Sustainable Energy Reviews, vol. 51 (2015), pp. 1428–1445.

15ME10L	DESALINATION	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Choose suitable desalination technology for given application (K4).

Different Desalination technologies – Membrane, Thermal and hybridation Desalination –Solar PV powered Desalination - Solar thermal Desalination: passive and active type – Technical Challenges – Design consideration – Performance.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Chandrashekara M and Avadhesh Yadav, “Water desalination system using solar heat: A review”, Renewable and Sustainable Energy Reviews, Vol. 67, pp. 1308–1330.
2. Mohammed Shadi S Abujazar, Fatihah S, Rakmi A R, Shahrom M Z, “The effects of design parameters on productivity performance of a solar still for seawater desalination: A review”, Desalination, Vol. 385, pp. 178–193.
3. Sharshir S W, Elsheikh A H, et al., “Thermal performance and exergy analysis of solar stills – A review”, Renewable and Sustainable Energy Reviews, Vol. 73, pp. 521–544.
4. Sharon H and Reddy K.S, “A review of solar energy driven desalination technologies”, Renewable and Sustainable Energy Reviews, Vol.41, pp. 1080–1118.
5. Malik M A S, Tiwari G N, Kumar A and Sodha M S, “Solar Distillation”, Pergamon Press, New York, 1982.
6. Soteris A Kalogirou, “Solar Energy Engineering: Processes and Systems”, Academic Press, Technology & Engineering, 2009.
7. Vassilis Belessiotis Soteris Kalogirou Emmy Delyannis, “Thermal Solar Desalination”, Academic Press, ISBN: 9780128097823, 2016.
8. Garg H P, Prakash J, “Solar Energy: Fundamentals and Applications”, Tata McGraw-Hill Education, 2000.

15ME11L INDUSTRIAL DRAWING READING WITH GD&T

L	T	P	C
1	0	0	1

COURSE OUTCOMES

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

CO1: Evaluate limits, fits and tolerance for components/products (K4).

Industrial Drawing reading – First and third angle projection – free hand sketches – BIS SP46 - Engineering drawing and tolerance – Limits, fits and Tolerance - Tolerance symbols and terms – rules and concepts of GD&T - use of GD&T – MMC, LMC – datum – Form – Orientation – profile – Runout.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Alex Krulikowsi, "Fundamentals of Geometric Dimensioning and Tolerancing", 2nd Edition, Delmar publications, 2012.
2. Standards for dimensioning and tolerancing - ASME Y 14.5, 2009.
3. James D Meadows, "GD&T Application, analysis and Measurements", ASME Press 2009.

15ME12L PROCESS EQUIPMENT DESIGN

L	T	P	C
1	0	0	1

COURSE OUTCOMES

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

CO1: Design the components of process equipments (K4).

Pressure Vessel Introduction – Design of Flanges – Design of supports for vertical and horizontal vessels – Openings, nozzles and External loadings – Storage Vessels - Evaporators crystallizers – Distillation and fractionization equipment.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Joshi, "Process Equipment Design", Macmillan Company of India, 2016.
2. Dennis R Moss, Michael M. "Pressure Vessel Design Manual", 4th edition, Butterworth-Heinemann, 2012.
3. James R Couper, Roy Penney W, James R Fair, "Chemical Process Equipment: Selection and Design", 3rd Edition, Elsevier, 2012.
4. Stanley M Walas, "Chemical Process Equipment Selection and design", Butterworth-Heinemann, 1988.
5. Lloyd E Brownell and Edwin H Young, "Process Equipment Design: Vessel Design", John Wiley & Sons, 1959.

15ME13L TECHNIQUES FOR VIBRATION MONITORING AND CONTROLS

L	T	P	C
1	0	0	1

COURSE OUTCOMES

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

CO1: Apply vibration based condition monitoring in rotating machineries. (K4).

Condition monitoring- methods – measurement of vibration, Vibration analysis, Vibration and predictive maintenance, Monitoring machine vibration, Vibration transducers, Common vibration monitoring techniques. Industrial case studies. Active and passive techniques in vibration control.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Davies A, “Handbook of Condition Monitoring: Techniques and Methodology”, Springer Science & Business Media, 2012.
2. Anders Brandt, “Noise and Vibration Analysis: Signal Analysis and Experimental Procedures”, John Wiley & Sons, 2011.
3. Robert Bond Randall, “Vibration-based Condition Monitoring”, John Wiley and Sons, Ltd., 2011.
4. Peter Tavner, Li Ran, Jim Penman, “Condition Monitoring of Rotating Electrical Machines”, the Institution of Engineering and Technology, London, United Kingdom, 2008.
5. Lihui Wang, Robert X Gao, “Condition Monitoring and Control for Intelligent Manufacturing”, Springer Science & Business Media, 2006.
6. Rao B K N, Davies A, “Handbook of Condition Monitoring Techniques and Methodology”, Springer-science business media, 1998.
7. Rao B K N, “Handbook of Condition Monitoring”, Elsevier, 1996.

15ME14L	CRASHWORTHINESS OF TUBULAR SHELLS	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Select suitable thin-walled sectional member for specific application (K4).

CO2: Evaluate the crashworthiness characteristics of shell structures. (K4).

Structural members–types- selection and applications. Crashworthiness –definitions- types of loading- Influence of materials, shape, and boundary conditions on energy absorption and mode of collapse. Evaluation on crashworthiness characteristics of simple shell member. Case studies– impact on helmets –mode of collapse- inferences.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Ambrosio J A C, “Crashworthiness: Energy Management and Occupant Protection”, Springer, 2001.
2. Ahmed Elmarakbi, Lukaszewicz, “Automotive Composite Structures for Crashworthiness”, John Wiley & Sons Ltd, 2014.
3. http://www.tandfonline.com/toc/tcrs20/current.
4. https://www.journals.elsevier.com/thin-walled-structures/
5. https://www.journals.elsevier.com/international-journal-of-impact-engineering.
6. https://www.journals.elsevier.com/composite-structures.
7. https://www.journals.elsevier.com/materials-and-design/

15ME15L	FAILURE MODE AND EFFECTS ANALYSIS	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Apply FMEA techniques for product improvement (K4).

Failure mode effect analysis (FMEA) – requirements of reliability - failure rate - FMEA stages – Types of FMEA - Failure - Failure mode - Failure cause and/or mechanism - Failure effect – Detection – Probability - Risk Priority Number (RPN) – Severity - Remarks / mitigation / actions.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Bilal M Ayyub, “Risk Analysis in Engineering and Economics”, 2nd Edition, CRC Press, 2014.
2. Carl Carlson, “Effective FMEAs: Achieving Safe, Reliable, and Economical Products and Processes using Failure Mode and Effects Analysis”, John Wiley & Sons, 2012.
3. Raymond J Mikulak, Robin McDermott, Michael Beauregard, “The Basics of FMEA”, 2nd Edition, CRC Press, 2008.
4. Stamatis D H, “Failure Mode and Effect Analysis”, ASQ Quality Press, 2003.
5. Kevin Otto, Kristin Wood, “Product Design Techniques in Reverse Engineering and New Product Development”, Pearson Education (LPE), 2001.

15ME16L	DESIGN OF EXPERIMENTS	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Select suitable techniques for design of experiments in an engineering product design and evaluation. (K4).

Importance of Experiments, Experimental Strategies, Basic principles of Design, Terminology, ANOVA, Steps in Experimentation, Sample size, Single Factor experiments – Completely Randomized design, Randomized Block design, Statistical Analysis, Multifactor experiments – Two and three factor full Factorial experiments, 2^K factorial Experiments, Confounding and Blocking designs, Fractional factorial design, Taguchi’s approach - Steps in experimentation, Design using Orthogonal Arrays, Data Analysis, Robust Design.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Linda C Schmidt, George E Dieter, “Engineering design”, McGraw-Hill Education, 2015.
2. Jiju Antony, “Design of Experiments for Engineers and Scientists”, Elsevier, 2014.
3. Paul G Mathews, “Design of Experiments with MINITAB”, ASQ Quality Press, 2005.
4. Ronald Fisher, “The Design of Experiments”, Hafner Press, 8th Revised edition, 1972.

15ME17L	TAGUCHI METHODS	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Apply Taguchi methods in design of experiments (K4).

Overview of Design of Experiments and Taguchi approach - common experiments and methods of analysis. Steps in experimentation, design using Orthogonal Arrays, data analysis, Robust design - control and noise factors, S/N ratios, parameter design, Multilevel experiments, Multi response optimization – case studies.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Krishnaiah K and Shahabudeen P, “Applied Design of Experiments and Taguchi Methods”, PHI learning private Ltd., 2012.
2. Khosrow Dehnad, “Quality Control, Robust Design and the Taguchi Method”, Springer, 2012.
3. Ranjit K Roy, “A Primer on the Taguchi Method”, 2nd Edition, Society of Manufacturing Engineers, 2010.
4. Ranjit K Roy, “Design of Experiments using the Taguchi Approach”, John Wiley & sons, Inc., 2001.

5. Nicolo Belavendram, “Quality by Design; Taguchi techniques for industrial experimentation”, Prentice Hall, 1995.

15ME18L	NATURAL FIBER COMPOSITES	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Predict the characteristics of different natural fibers and its composites (K4).

Fundamentals of natural fiber composite materials: Natural fibers-bio diversity-extraction methods-polymer matrix-composite fabrication methods. Pre-processing methods of natural fibers: Introduction-Chemical agents used for natural fiber surface modification-treatment procedures. Characterization of natural fibers: FTIR spectrography, SEM topography and other testing methods- investigations. Applications in Automotive Industry.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Campilho R D S G, “Natural Fiber Composites”, CRC Press, 2015.
2. Alma Hodzic, Robert Shanks, “Natural Fibre Composites: Materials, Processes and Properties”, Woodhead Publishing, 2014.
3. Douglas D Stokke, Qinglin Wu, Guangping Han, “Introduction to Wood and Natural Fiber Composites”, John Wiley & Sons, 2013.
4. Ning Hu, “Composites and their properties”, Intech, 2012.
5. Adel zaki el-sonbati, “Thermoplastic-composite materials”, InTech, 2012.
6. John cuppoleeti, “Metal, ceramic and polymeric composites for various uses”, Intech, 2011.
7. Frederick T Wallenberger, Norman Weston, “Natural Fibers, Plastics and Composites”, Springer Science & Business Media, 2011.
8. Brahim Attaf, “Advances in composite materials-eco design and analysis”, Intech, 2011.
9. Pickering K, “Properties and Performance of Natural-Fibre Composites”, Elsevier, 2008.

15ME19L	OPTIMIZATION IN SCHEDULING	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Choose various objectives, constraints and parameters of scheduling environment (K4).

CO2: Apply evolutionary algorithms to scheduling problems with single and multi-objectives (K4).

Scheduling fundamentals **7**

Single machine scheduling - Measures of performance -Shortest processing time (SPT) -Rule to minimize Mean flow time - Weighted mean flow time - Earliest Due Date - Rule to minimize maximum lateness - Model to minimize total tardiness. Branch and Bound technique - Hodgson’s algorithm- Parallel processor in single machine scheduling. Application of scheduling Software.

Optimization in Scheduling **8**

Flow shop and Job shop scheduling- Evolutionary algorithms – Johnson’s algorithm. GA – application to scheduling problems - structure – Binary coded and real coded – parameters-crossover, mutation, local optimal, global optimal. Single and multi objective optimization.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Alessandro Agnetis, Jean-Charles Billaut, Stanisław Gawiejnowicz, Dario Pacciarelli, Ameur

Soukhal, “Multiagent Scheduling: Models and Algorithms”, Springer Science & Business Media, 2014.
2. Panneerselvam R, “Production and Operations Management”, PHI Learning Pvt. Ltd., 2012.
3. Jacek Błażewicz, Klaus H Ecker, Erwin Pesch, Günter Schmidt, Jan Weglarz, “Handbook on Scheduling: From Theory to Applications”, Springer Science & Business Media, 2007.
4. Rajendran Saravanan, “Manufacturing Optimization through Intelligent Techniques”, CRC Press, 2006.
5. Joseph Y-T Leung, “Handbook of Scheduling: Algorithms, Models, and Performance Analysis”, CRC Press, 2004.

15ME20L	FUNCTIONAL MATERIALS FOR ENERGY CONVERSION	L	T	P	C
		1	0	0	1

COURSE OUTCOME

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

CO1: Select functional materials for energy conversion and storage. (K4)

Procedure for functional material development. Review of materials developed/available. Need for functional materials, synthesis methods, energy application. Design philosophy of functional materials, Nanostructures and Advanced Materials for solar energy conversion, fuel cell and energy storage.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. David Munoz-Rojas, Xavier Moya, “Materials for Sustainable Energy Applications: Conversion, Storage, Transmission, and Consumption”, Pan Stanford Publishing, 2016.
2. Kilner J A, Skinner S J, Irvine S J C, Edwards P P**, “**Functional Materials for Sustainable Energy Applications”, Woodhead Publishing Limited, 2012

15ME21L	DESIGN FOR MANUFACTURABILITY	L	T	P	C
		1	0	0	1

COURSE OUTCOME

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

CO1: Apply the concepts of design for manufacturability. (K4).

Review of Tolerances, Limits and Fits. Influences of materials Space factor, Size and Weight on form design. Design for machining, casting, forging and welding.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. David M Anderson, “Design for Manufacturability: How to Use Concurrent Engineering to Rapidly Develop Low-Cost, High-Quality Products for Lean Production”, CRC Press, 2014.
2. Chitale A K, Gupta R C, “Product Design and Manufacturing”, PHI Learning Pvt. Ltd., 2013
3. David M Anderson, “Design for Manufacturability & Concurrent Engineering: How to Design for Low Cost, Design in High Quality”, Design for Lean Manufacture, and Design Quickly for Fast Production, CIM Press, 2004
4. Boothroyd G, Dewhurst P and Knight W, “Product Design for Manufacture and Assembly”, Marcell Dekker, 2002
5. Harry Peck, “Designing for Manufacture”, Pitman Publishing, 1983

6. Chitale A K and Gupta R C, “Product Design and Manufacturing”, PHI 2007
7. Bralla J G, “Hand Book of Product Design for Manufacturing”, McGraw Hill Publications, 2000

15ME22L	PROJECT MANAGEMENT	L	T	P	C
		1	0	0	1

COURSE OUTCOME

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

CO1: Develop a project with a calendar, start date and scheduling method (K4).

Principles - Introduction to MS project - Taking a first look at project – Starting Project, Entering information, Changing views, Creating a new project: Gathering information, Opening a project file, Establishing basic project information, Looking at project calendars, Entering tasks, Adding subtasks, Saving project files, Working with project outline – Adjusting tasks in an outline, Copying tasks.
Creating resources and assigning costs: Understanding resources, Creating resource list, Modifying resource information, Using resources and tasks, Handling unusual cost situations.

L:15; TOTAL: 15 PERIODS

REFERENCES

1. Nancy Muir, “Project 2010 for Dummies”, John Wiley & Sons, 2010.
2. Sham Dayal, “Earned Value Management Using Microsoft Office Project: A Guide for Managing Any Size Project Effectively”, J. Ross Publishing, 2008.
3. Frederick B Plummer, “Project Engineering: The Essential Toolbox for Young Engineers”, Butterworth-Heinemann, 2007.
4. Elaine Marmel, “Microsoft Office Project 2007”, Wiley Publishing Inc, 2007.

B.E. - ELECTRONICS AND COMMUNICATION ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ONE CREDIT ELECTIVE COURSES (PEC)

S. No	Course Category	Course Code	COURSE TITLE	L	T	P	C	QP
1.	PEC	15EC01L	Basic Device Driver Programming Practice	0	0	2	1	-
2.	PEC	15EC02L	Introduction to Robotics and Machine Vision	1	0	0	1	G
3.	PEC	15EC03L	Automotive Embedded Systems	1	0	0	1	G
4.	PEC	15EC04L	Basics of GiT	0	0	2	1	-
5.	PEC	15EC05L	Image Processing Practice using Omap3530 and Opencv	0	0	2	1	-
6.	PEC	15EC06L	Application and Operations Security	1	0	0	1	G
7.	PEC	15EC07L	Security Engineering	1	0	0	1	G
8.	PEC	15EC08L	Security Management Practices	1	0	0	1	G
9.	PEC	15EC09L	Introduction to cybercrime analysis	1	0	0	1	G
10.	PEC	15EC10L	Introduction to OFDM	1	0	0	1	G
11.	PEC	15EC11L	Spreading codes in Spread Spectrum Modulation	1	0	0	1	G
12.	PEC	15EC12L	Practical Antenna Design: From Theory to Practice	1	0	0	1	G
13.	PEC	15EC13L	MIMO Antenna Engineering	1	0	0	1	G
14.	PEC	15EC14L	Advanced Multimedia Techniques	1	0	0	1	G
15.	PEC	15EC15L	Multimedia Processing and Coding Lab	0	0	2	1	-
16.	PEC	15EC16L	Broadcasting and Streaming Techniques	1	0	0	1	G
17.	PEC	15EC17L	Printed Circuit Board Design	1	0	0	1	G

15EC01L BASIC DEVICE DRIVER PROGRAMMING PRACTICE

L	T	P	C
0	0	2	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to,

CO 1: Write character type Device Driver programs for the given On chip peripherals.

Experiments

1. Theoretical introduction about the significance and different types of Device driver.
2. Device driver program to perform on-board LEDS glow using GPIO logic block
3. Device driver program to perform on-board LEDS glow using Timer0 logic block
4. Device driver program to perform LCD interface using SPI logic block
5. Device driver program to perform SPI communication using SPI logic blocks of two different lpc 2148 Boards
6. Device driver program to perform serial data communication using UART logic block
7. Device driver program to perform GSM interface using UART logic block
8. Device driver program to perform DC Motor interface using UART and SPI logic blocks.
9. Device driver program to perform ToF interface using I2C logic blocks of different processor families.

P: 30 TOTAL: 30 PERIODS

REFERENCES

1. Tammy Noergaard , “Embedded Systems Architecture”, Elsevier Inc, 2005
2. Sreekrishnan Venkateswaran, “Essential Device Driver”, Prentice Hall, 2008
3. www.arm.com
4. www.embeddedrelated.com
5. www.embeddedarm.com

15EC02L INTRODUCTION TO ROBOTICS AND MACHINE VISION

L	T	P	C
1	0	0	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to,

CO 1: Understand the essential components of Industrial robot.

CO 2: Utilize the Quadrature Encoder and Stereo Vision camera in Robotic application.

Robot definitions-evaluation-robot anatomy-Coordinates frames-object description in space-robot modeling by Direct kinematic model-Trajectory planning-Architecture of robot vision system-Quadrature Encoder principles and interfacing- Camera types and Stereo Vision camera interfacing

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. R.K.Mittal and I.J.Nagrath, “Robotics and Control”, Tata McGraw-Hill, 9th Reprint, 2008
2. Ashitava Ghosal, “Robotics Fundamental Concepts and Analysis”, Oxford University press, 2006.
3. www.ti.com

15EC03L	AUTOMOTIVE EMBEDDED SYSTEMS	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to,

CO1: Distinguish the different communication protocols for In_car Embedded networks

CO 2: Understand the essential functional domains of In_vehicle embedded system.

Different Functional domains of Vehicle-Standardized components for cooperative development process-Certification issues of safety critical In_vehicle embedded system –AUTOSAR architecture-main areas of AUTOSAR standardization-Examples of AUTOSAR in practice –Open issues for automotive communication protocols-In_car Embedded networks using CAN Protocol.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Nicholasl Navart and Francoise Simonot lion, “Automotive Embedded System”, CRC Press, 1st Reprint, 2014.
2. www.can-newsletter.com
3. www.autosar.org
4. Marco Di Natale, Haibo Zeng and Arkadeb Ghosal, “Understanding and Using the Controller Area Network Communication Protocol- Theory and Practice”, Springer, 2012

15EC04L	BASICS OF GiT	L	T	P	C
		0	0	2	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO 1: Understand how to coordinate with other programmers in code sharing environment under any Version control system.

LIST OF EXPERIMENTS

1. **A) Git Basics**
    1. Introduction to Version Control
    2. Introduction to Git
    3. Viewing History
    4. Track and Un track Files
    5. Creating a New Repository
2. B) **Git Internals**
    1. Building Git From Scratch
        - Simple Single File Model
        - SHA1 Single File Model
        - Ordered Single File Model
        - Detached Head Model
        - Multi-Branch Model
        - Merge Commit Model
        - Multi-File Model
    2. Exploring a Git Repo
    3. Staging
3. C) **Git Remotes**
    1. Merging
    2. Remote Repositories
        - Git Clone
        - Sharing Changes
        - Fetching Changes
        - Remote Tracking Branch
        - Managing Remotes
4. D) **Advanced Git**

1. Rebase Interactive
2. Interactive Add
3. Stash

Using GitHub

5. **Study experiments:**
   1. Concurrent version control system.(openCVS)
   2. PERFORCE HELIX

P:30 TOTAL: 30 PERIODS

15EC05L	IMAGE PROCESSING PRACTICE USING OMAP3530 AND OPENCV	L	T	P	C
		0	0	2	1

COURSE OUTCOMES

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

CO1: Perform the Image Processing using OMAP3530 and OPENCV.

LIST OF EXPERIMENTS

1. Program to Read, Load and Display the given JPEG images.
2. Program to perform Negative Logarithmic transformation of different images.
3. Develop Histogram equalization algorithm and display the Histogram equalized image.
4. Program to perform filtering operation in spatial domain on noisy image corrupted by both Gaussian noise and Salt Pepper noise. Find signal to noise ratio in both cases.
5. Program to perform Gaussian noise removal using Filters.
6. Program to perform Sharpening of two different images using Filters.
7. Program to perform segmentation on bi-level images using histogram method.
8. Program to perform Erosion and Dilation.
9. Program to perform scaling and shearing.
10. Program to perform DISTANCE measurement using opencv and single camera

P:30 TOTAL: 30 PERIODS

15EC06L	APPLICATION AND OPERATIONS SECURITY	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Describe the Operations department responsibilities and investigate the threats to operations security.

CO2: Conduct incident management.

CO3: Analyze how to enhance security in software development.

Operations Security

Controlling and Monitoring Access, Security Assessment and Testing, Security Operations - Provisioning and Managing Resources, Configuration Management, Vulnerability Testing.

Incident Response

Preventing and Responding to Incidents, Disaster Recovery Planning, Incidents and Ethics.

Application Development Security

Software Development Security, Malicious Code and Application Attacks.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Shon Harris, “All-in-One CISSP”, Tata Mc Graw Hill, 6th Edition, 2013.
2 James Michael Stewart, Ed Tittel, Mike Chapple, Sybex, “Certified Information Systems Security Professional”, A Wiley Brand, 7th Edition, 2015.

15EC07L	SECURITY ENGINEERING	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to,

CO1: Understand the fundamental concepts of security models.
CO2: Assess and mitigate the vulnerabilities of various systems.
CO3: Apply secure principles to communication channel and network components.

Security Models

Security models fundamental concepts, Security evaluation models, Security capabilities of information systems

Security Vulnerabilities

Security architectures, designs, and solution elements vulnerabilities, Web-based systems vulnerabilities, Mobile systems vulnerabilities, Embedded devices and cyber-physical systems vulnerabilities, Physical Security Requirements

.

Secure Network Architecture

Communication and Network Security, Secure network components, Secure communication channels, Prevent or mitigate network attacks

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Shon Harris, “All-in-One CISSP”, Tata Mc Graw Hill, 6th Edition, 2013.
2. James Michael Stewart, Ed Tittel, Mike Chapple, Sybex, “Certified Information Systems Security Professional”, A Wiley Brand, 7th Edition, 2015.

15EC08L	SECURITY MANAGEMENT PRACTICES	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO1: Understand and apply security governance principles and risk management concepts.
CO2: Conduct business impact analysis business.
CO3: Classify information and supporting assets.

Security Governance and Risk Management

Concepts of Confidentiality, Integrity, and Availability, Security Governance Principles, Documented Security Policies, Threat Modeling, Personnel Security and Risk Management Concepts, Information Security Education.

Business Continuity Planning

Planning for Business Continuity, Business Impact Assessment, Continuity Planning, Laws, Regulations, and Compliance

Protecting Security of Assets

Classifying and Labeling Assets - Sensitive Data, Classifications, Data Security Requirements, Managing Sensitive Data , Data Roles, Protecting Privacy.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Shon Harris, “All-in-One CISSP”, Tata Mc Graw Hill, 6th Edition, 2013.
2. James Michael Stewart, Ed Tittel, Mike Chapple, Sybex, “Certified Information Systems Security Professional”, A Wiley Brand, 7th Edition, 2015.

15EC09L	INTRODUCTION TO CYBERCRIME ANALYSIS	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO 1: Describe the types of Cybercrime and Cyber forensic.

CO 2: Analyze the methods of Cybercrime Investigation and Digital Evidence data against Cybercrime.

CO 3: Investigate cybercrimes in different scenarios.

Cybercrime and Cyber forensic

Introduction on Cybercrime, Types of Cybercrime, Cyber Forensics, Application of Law, Pre-Investigation Assessment.

Procedure for Cybercrime Investigations

Standard Operating Procedures, Crime Scene Investigation, Forensic Collection of Digital Evidence, Gathering and Analyzing the Data.

Investigation of Offences

Different Case Scenarios, Preserving the Digital Media, Preparing the Evidence.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. “Cybercrime Investigation Manual”, Data Security Council of India.
2. “Investigating Network Intrusions and Cybercrime: EC-Council | Press”, Course Technology-Cengage Learning.

15EC10L	INTRODUCTION TO OFDM	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to,

CO1: Illustrate the basic need and concept of OFDM

CO2: Analyze the effects of symbol time offset in OFDM

CO3: Analyze the effect of carrier frequency offset in OFDM

CO4: Analyze the effect of PAPR in OFDM.

UNIT 1 OFDM BASICS

Multi-carrier generation, OFDM modulation and demodulation.

UNIT 2 OFDM TIMING SYNCHRONIZATION

Effect of symbol-time offset (STO), Estimation of STO, Compensation of STO, and Effect/compensation of sampling-clock offset (SCO).

UNIT 3 OFDM FREQUENCY SYNCHRONIZATION

Effect of carrier-frequency offset (CFO), Estimation of CFO, and Compensation of CFO.

UNIT 4 PEAK-TO-AVERAGE POWER RATIO REDUCTION (PAPRR)

Distribution of OFDM-signal amplitude; PAPR & oversampling; Mitigation methods: clipping & filtering, selective mapping (SLM), partial transmit sequence (PTS), tone reservation (TR), tone injection (TI), etc.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Richard van Nee, Ramjee Prasad, “OFDM for Wireless multimedia communications”, Artech House, 2000.
2. Andrea Goldsmith, “ Wireless Communications”, Cambridge University Press, 2005

15EC11L	SPREADING CODES IN SPREAD SPECTRUM MODULATION	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to,

CO1: Identify the popular spreading codes in communication
CO2: Discuss the various code generation methods.
CO3: Analyze and select code for spreading.
CO4: Discuss the applications of spreading codes.

UNIT 1 DESCRIPTION OF POPULAR CODES

Maximal length sequences code, Gold code, and Kasami code

UNIT 2 CODES GENERATION

Binary Shift Register concept for generation of PN sequence: balance property, run length property, and Correlation Property, generation of Gold code set, generation of Kasami code set.

UNIT 3 CODE SELECTION FOR SPREADING

Comparison of auto correlation and cross correlation of various codes such as PN sequence code, M-Sequence code, Gold code, Kasami code.

UNIT 4 APPLICATIONS OF THE SPREADING CODES

Applications of spreading code to cellular communication systems, Second and third generation CDMA systems/ standards, Design examples of IS-95, GPRS, Bluetooth, W-CDMA, Wi-Fi.

L: 15 TOTAL: 15 PERIODS

REFERENCES

3. 1. John Proakis and Masoud Salehi, Digital Communications, McGraw-Hill, 5th Edition, 2007.
4. 2. T. S.Rappaport, Wireless Communications: Principles and Practice (2nd Edition), Prentice Hall, 2001.
3. R.L. Peterson, R. L Ziemer, D. E Borth, “Introduction to Spread Spectrum Communications”, Upper Saddle River: NJ, Prentice Hall, 1995.
4. E. H. Dinan ve B. Jabbari, "Spreading codes for direct sequence CDMA and wideband CDMA cellular networks", IEEE Communications Magazine, vol. 36, pp.48-54, September 1998.

15EC12L	PRACTICAL ANTENNA DESIGN: FROM THEORY TO PRACTICE	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to,

CO1: Discuss the practical consideration and techniques in designing antennas for wireless applications

CO2: Discuss the materials requirement for fabrication and parameters measurements.

CO3: Learn how to use the software packages to design various high frequency components.

Antenna parameters - field and circuit point of view, Practical consideration and techniques in designing antennas, Conducting and Dielectric materials for antenna fabrication.

Computational electromagnetic methodologies - time and frequency domain, Analytical method, **Numerical methods for EM modelling**(Principle)– Method of Moments (MoM), Finite Difference Time Domain (FDTD), Finite Element Method (FEM), Comparison of CEM methods(Advantages/Disadvantages)**, Applications of CAD software simulators.**

1. Design and simulation Planar antennas
2. S-parameter analysis on Transmission line and discontinuities
3. Modelling and simulation of microwave passive components

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Yi Huang and Kevin Boyle, “Antennas from theory to practise” John Wiley and sons, 2008.
2. M. N. Sadiku, “Numerical Techniques in Electromagnetics” CRC Press, 1992.
3. Joseph Carr, George Hippisley, “Practical Antenna Handbook, 5th Edition”, Mc.Graw Hill Professional, 2011.
4. Kyohei Fujimoto, HisashiMorishita, “Modern small antennas”, Cambridge university press, 2013.
5. A. Bondeson, T. Rylander, P. Ingelstrom, “Computational Electromagnetics” Springer 2005.
6. Daniel G. Swanson, Wolfgang J. R. Hoefer, “Microwave circuit modelling using electromagnetic field simulation”, Artech house, 2003.

15EC13L	MIMO ANTENNA ENGINEERING	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to

CO1: Understand the MIMO concept for Wireless Communication Systems with parameters

CO2: Discuss the guidelines to design an antenna for gadgets applications.

CO3: Discuss the Isolation enhancement and measurement techniques.

Multiple-Input-Multiple-Output (MIMO) Technology, **MIMO Antenna Parameters** –Isolation, Mean effective gain, Diversity gain. **Design guidelines of Single and Multi band MIMO antenna** system

for access points, mobile phones, tablets and USB dongle applications, **Isolation enhancement techniques** – antenna placement and orientation, defected ground structure, metamaterial, **MIMO antenna performance measurement techniques –** multiprobe OTA (Over The Air) method, Two stage OTA method, Reverberation chamber OTA testing method.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Mohammad S. Sharawi "Printed MIMO antenna engineering", Artech house, 2014.
2. Franco De Flaviis, Llui Jofre, Jordi Romeu, Alfred Grau, "Multi antenna systems for MIMO communications", Morgan & Claypool, 2008.
3. AntonisKalis, Athanasios G Kanatas, Constantinos B. Papadias, "Parasitic Antenna arrays for Wireless MIMO systems", Springer, 2014.

15EC14L	ADVANCED MULTIMEDIA TECHNIQUES	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to,

CO 1: Understand the recent developments in Video and Audio compression

CO 2: Do projects on video and audio processing and compression

CO 3: Do projects to improve transcoding efficiency

Introduction to Video

Analog Vs Digital, Video Data, Video Timing, Video Resolution, Video Compression, Color Spaces

Digital Video Processing

Chroma Subsampling, Video Scaling, Scan rate conversion, Interlaced viz-a-viz Progressive conversion, DCT based Compression

Video Compression

H.264 Video Compression - Syntax, Prediction, Transform and Coding, H.264 Conformance, Transport

H.265 Video Compression, Architecture, Decoding Process, Parsing Process, Syntax and Semantics

Audio Processing

Digital Audio Interface, Equalizers, Loudness management, SRC, Level, Volume control

Audio Compression

MPEG Advanced Audio Coding, Dolby AC3, EAC3, AC5, ATMoS, H265+

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Video Demystified, Keith Jack, "A Handbook for the Digital Engineer", 3rd Edition, LLH Technology Publishing.
2. Iain E. Richardson, "The H.264 Advanced Video Compression Standard", 2nd Edition, Wiley Publications.
3. H265 Video Standard – Recommendation ITU-T H.265
4. Digital Audio Signal Processing – Udo Zolzer, John Wiley & Sons Ltd
5. Introduction to Data Compression – Khalid Sayood – Third Edition – ELSEVIER

15EC15L	MULTIMEDIA PROCESSING AND CODING LAB	L	T	P	C
		0	0	2	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to,

CO 1: Understand state-of-the-art video and audio transcoding

CO 2: Add values to improve effectiveness in video and audio compression by projects

Experiments

1. Study resolution, fields/frame, Color spaces in YUV files
2. Change Chroma format, crop, apply DCT and IDCT
3. Analysis on Compressed audio using Audacity
4. FFMPEG based Video Compression and Decompression
5. X264 based H.264 encoding and streams analysis
6. X265 based H.265 encoding
7. VLC player based Video and Audio transcoding
8. Understand different video and audio compression using VLC player
9. Live video and audio encoding from Digital Video camera

P: 30 TOTAL: 30 PERIODS

15EC16L	BROADCASTING AND STREAMING TECHNIQUES	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to,

CO 1: Understand the present implementation of multimedia broadcasting and streaming techniques

CO 2: Add values by projects on efficiency improvement

Digital Modulation

Brief about SATCOM w.r.to DVB - Transmitting Digital Television Signals by Satellite – DVB-S/S2 - Broadband Cable Transmission according to DVB-C, DVB-C2, Terrestrial Transmission of Digital Television Signals (DVB-T), DVB-T2

Broadcasting Techniques

Digital Video Broadcasting for Handheld Devices, Digital Audio Broadcasting, DRM

Streaming Techniques

Overview of streaming and communication applications, Challenges in Video Streaming, Transport and Rate control for overcoming Time-varying Bandwidths, Playout Buffer for overcoming Delay Jitter - Error control for overcoming Channel losses, Error Resilient Video Coding, Media Streaming Protocols and Standards, Streaming media content delivery networks, Scalable audio DRM, Object based Video Transmission

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. W. Fischer , “Digital Video and Audio Broadcasting Technology”, 3rd Edition, Springer, Signals and Communication Technology
2. John C. Apostolopoulos, “Video Streaming: Concepts, Algorithms, and systems, Mobile and Media Systems Lab”.

15EC17L	PRINTED CIRCUIT BOARD DESIGN	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

Upon completion of this course, the student will be able to,

CO 1: Involve in the various process of PCB design.

CO 2: Attain in-depth core knowledge in design, performance analysis and fabrication of Printed Circuit Boards.

CO 3: Predict the factors affecting PCB performance.

PCB DESIGN PROCESS AN OVERVIEW

Conception Level Introduction: Specifying Parts, Packages and Pin Names, The Partlist, The Netlist, Making Netlist Files, Placing Parts, Routing Traces, Adding Text, Plot and Drill Files, PCB Layout, Layer List and Selection Mask, Panning and Zooming, Projects, PCB Elements.

PCB DESIGN PROCESS

Board Outline; Parts-Anatomy of a Part, Partlist, Editing Parts, Reference Designator; Mounting Holes; Nets, Ratlines and Routing; Nets - Netlist; Ratlines; Vias; Modifying Traces, Swapping Pins; Importing Netlist; Copper Areas; Text ; Solder Mask Cutouts; Groups; Design Rule Checking; Exporting Drill and Gerber Files; Drills; Footprints and Libraries Adding and Editing Pins, Polylines.

APPLICATION ORIENTED DESIGN AND FABRICATION

Schematic Diagram, Creating the Project, Importing the Net list File, Drawing the Board Outline, Adding Mounting Holes, Placing Parts, Adding Parts and Editing Nets, Adding Copper Areas, Routing, Nets, Ratlines and Routings, Adding Text, Checking Design Rules, Fabrication Process and Methodology

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. R.S.Khandpur, “Printed Circuit Boards: Design, Fabrication, and Assembly”, McGraw-Hill, 2005
2. Bossart, "Printed Circuit Boards:Design and Technology", TMH, New Delhi 2008

B.E. - COMPUTER SCIENCE AND ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

ONE CREDIT ELECTIVE COURSES (PEC)

S. No	Course Category	Course Code	COURSE TITLE	L	T	P	C	QP
Data Science								
1.	PEC	15CS01L	Python Programming	0	0	2	1	-
2.	PEC	15CS02L	R Programming	0	0	2	1	-
Web Platform								
3.	PEC	15CS03L	Ruby on Rails Web Development	1	0	0	1	G
4.	PEC	15CS04L	Front End Web Development	0	0	2	1	-
5.	PEC	15CS05L	Custom Web Service Design	0	0	2	1	-
Cloud Environment								
6.	PEC	15CS06L	Virtualized Data Environment	1	0	0	1	G
7.	PEC	15CS07L	Open Source Private Cloud Infrastrcuture Design	1	0	0	1	G
8.	PEC	15CS08L	Exploring Bigdata Management Tools	1	0	0	1	G
Visualization								
9.	PEC	15CS09L	Creative Image Manipulation	0	0	2	1	-
10.	PEC	15CS10L	3D Animation	0	0	2	1	-
11.	PEC	15CS11L	Game Programming	1	0	0	1	G
Health Care Systems								
12.	PEC	15CS12L	EHR Security	1	0	0	1	G
13.	PEC	15CS13L	Mobile Integrated Health Care Systems	1	0	0	1	G
Computational Science								
14.	PEC	15CS14L	Cellular Automata Paradigm	1	0	0	1	G
15.	PEC	15CS15L	Abstract Algebra	1	0	0	1	G
16.	PEC	15CS16L	Turing Machine Simulation and Complexity Theory	1	0	0	1	G
Platform Oriented Development								
17.	PEC	15CS17L	Vehicular Cloud Networking	1	0	0	1	G
18.	PEC	15CS18L	Embedded Systems Design	0	0	2	1	-
19.	PEC	15CS19L	APP Development Using Android	0	0	2	1	-
20.	PEC	15CS20L	Practicing Test Suites with Selenium IDE	0	0	2	1	-
21.	PEC	15CS21L	Business Intelligence Solution Development	0	0	2	1	-

15CS01L **PYTHON PROGRAMMING** **L T P C**
0 0 2 1

COURSE OUTCOMES

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

CO1: explore the operational models of python like function calls, algorithms, exceptions, object-oriented programming, and GUIs

CO2: develop programming and problem solving skills using Python

LANGUAGE CONSTRUCTS **8**

Running Python - Variables, expressions and Statements - Functions - Conditionals and recursion - Iterations - String - Dictionaries - Tuples - Files – Map, Reduce, Filter – Series – Data Frames

List of Exercises **10**

1. Write a Python program to get the current username, IP address, window size, system time.
2. Write a Python program to perform Interface design using turtle object.
3. Create two frozen sets A and B. Evaluate supports methods like copy (), difference (), intersection (), isdisjoint (), issubset (), issuperset (), symmetric difference () and union ().
4. Write a Python program to sum of all counts in collections.
5. Removal of duplicates from list with or without using set.
6. Pythagorean tuple within a range N without duplicates, using list comprehension
7. Knight move simulation in chess board from source point to destination point, list the set of moves.
8. Analysis of time complexity of selection, merge, Quick sort algorithms.
9. Recursive function design for palindrome, Fibonacci, gcd, factorial, isprime, ascending, descending, updown, downup, alternating sequences.
10. Use of map, reduce and filter to solve repetitive tasks.

MINI PROJECT (Any one topic as similar to the list given below) **12**

I. Word Processing

i. Design a **password generator**. Be creative with how you generate passwords - strong passwords have a mix of lowercase letters, uppercase letters, numbers, and symbols. The passwords should be random, generating a new password every time the user asks for a newpassword. Include your run-time code in a main method.

ii. Design a **TextBased Adventure Game**, the program will let users move through rooms based on user input and get descriptions of each room. To create this, you'll need to establish the directions in which the user can move, a way to track how far the user has moved (and therefore which room he/she is in), and to print out a description. You'll also need to set limits for how far the user can move. In other words, create "walls" around the rooms that tell the user, "You can't move further in this direction."

II. Intelligent Agent Design

i. Dice Rolling Simulator - a program that simulates rolling dice. When the program runs,it will randomly choose a number between 1 and 6. The number of sides on the die is up to you. The program will print what that number is. It should then ask you if you'd like to roll again. For this project, you'll need to set the min and max number that your dice can produce. For the average die, that means a minimum of 1 and a maximum of 6. You'll also want a function that randomly grabs a number within that range and prints it.

ii. 8-Queen Problem - This problem can be solved by searching for a solution. The initial state is given by the empty chess board. Placing a queen on the board represents an action in the search problem. In any solution, there must be exactly one queen in each of the columns. Thus, the possible actions can be restricted to placing a queen in the next column that does not yet contain a queen.

III. Data Science

ApplicantIncome and LoanAmount –

i. Prepare a boxplot that groups the ApplicantIncome versus their Gender.
ii. Display the ApplicantIncome extrema values as compared with mean values.
iii. Segregate the people with different education levels.
iv. Convert all our categorical variables into numeric by encoding the categories.
v. Make hypothesis to set the ball rolling. The chances of getting a loan will be for:
    - Applicants having a credit history
    - Applicants with higher applicant and co-applicant incomes
    - Applicants with higher education level
    - Properties in urban areas with high growth perspectives

SOFTWARE REQUIREMENTS

- OpenCV
- Python ver. 2.7/3.0+
- NLTK Toolkit

P: 30; TOTAL: 30 PERIODS

REFERENCES

1. Allen Downey, "Think Python - How to Think Like a Computer Scientist", 2nd Edition, Version 2.2.20, Green Tea Press, Needham MA, 2015.
2. Dive into Python 3, Mark Pilgrim, http://www.diveintopython3.net/
   NPTEL course material on "Programming, Data Structures and Algorithms in Python" by Madhavan Mukund.

15CS02L	**R PROGRAMMING**	**L T P C**
		0 0 2 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Create access and modify data in vectors, lists and matrices.
CO2: Construct simple test applications using data frames and generic classes.

List of Exercises

1. Design R program for performing linear algebra operations on vectors and matrices.
2. Implement list by accessing/adding/deleting/indexing elements in a list.
3. Design data frames using matrix operations rowMeans ( ), colMeans ( ), rbind ( ), cbind ( ) and apply ( ).
4. Develop R programming structures using control statements.
5. Simulate programming in R using built in Random Variety Generators.
6. Implement string manipulation utilities such as nchar ( ), substr ( ), paste ( ), sprint ( ), grep ( ) and strsplit ( ).
7. Implement a generic function on an S3 classes and S4 classes.

HARDWARE AND SOFTWARE REQUIREMENTS

HARDWARE:

- Processors - 2.0 GHz or Higher
- RAM – 2GB or Higher
- Hard Disk - 320 GB or Higher

SOFTWARE:

- OS – LINUX/ Windows 2007
- R.3.4.0-win and RStudio-1.0.143

P: 30; TOTAL: 30 PERIODS

REFERENCES

1. Norman Matloff , “The Art of R Programming: A Tour of Statistical Software Design”, No Starch Press, 2011.
2. https://www.r-project.org
3. http://heather.cs.ucdavis.edu/~matloff/R/RProg.pdf

15CS03L RUBY ON RAILS WEB DEVELOPMENT L T P C
1 0 0 1

COURSE OUTCOME

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

CO1: To know the fundamental concept of Ruby on Rails and MongoDB

Ruby on Rails: An Introduction - Rails with Active Record and Action Pack - Ruby on Rails Web Services and Integration with MongoDB.

L: 15; TOTAL: 15 PERIODS

REFERENCES

1. ‘Ruby on Rails Tutorial’, Michael Hartl, Addition Wesley, 2010.
2. ‘Ruby on Rails for Beginners: Rails Web Development Programming and Coding Tutorial’, Joseph Joyner, Addition Wesley, 2012.

15CS04L FRONT END WEB DEVELOPMENT L T P C
0 0 2 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Gain fundamental knowledge of front end web development

CO2: Build interactive websites by learning the foundations on HTML, HTML5, CSS and CSS3.

Introduction to Front End Web Development - Introduction to HTML and HTML5 – HTML5 Syntax- HTML5 Attributes-Form Designing - HTML5 Events- HTML5 Web Forms- HTML5 Canvas-Scripting Media Elements - Introduction to CSS and CSS3- Introduction and Selectors -CSS3 Borders –CSS3 Backgrounds-CSS3 Text Fonts and Transforms- CSS3 Transitions- CSS3 Animations.

P: 30; TOTAL: 30 PERIODS

REFERENCES

1. https://www.bestdotnettraining.com/pdf/HTML5andCSS3Syllabus.pdf
2. http://www.html5andcss3.org
3. http://www.thewebevolved.com/download/The-Web-Evolved-Sample-Chapter12.pdf
4. Ed Tittel and Chris Minnick,” HTML5 and CSS3 All–in–One For Dummies”, John Wiley & Sons; 3rd Revised edition 2014.

15CS05L CUSTOM WEB SERVICE DESIGN L T P C
0 0 2 1

COURSE OUTCOME

Upon Completion of this course, the students will be able to

CO1: Create web page using DRUPAL and can manage user and site

Creating first module - Create a custom permission - Using Form API create a form - Create a custom form validation - Create a custom content type manually - Import a content using feeds - Add a google map using theme - Create a block.

P: 30; TOTAL: 30 PERIODS

SOFTWARE REQUIREMENT

- Drupal version 8.x

15CS06L VIRTUALIZED DATA ENVIRONMENT L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: Understand the basic concepts and methods of Virtualization
CO2: Leverage VMs to build testing, support, and training environments
CO3: Manage Virtual environment and Migrate from physical to virtual machines

VIRTUALIZATION CONCEPTS: Defining virtual machines - Advantages of deploying VM - VMware Workstation – Server - Oracle VirtualBox. **ABSTRACTING HARDWARE:** Partitioning shared resources - Accessing raw and virtual disks - Virtualizing CPU and memory resources.

DEPLOYING VIRTUAL WORKSTATION SOFTWARE: Planning for automatic installations - Designing virtual networks - Bridged, NAT and host-only networking. **BUILDING GUEST OPERATING SYSTEMS:** Allocating host resources - Configuring virtual hard drives -Managing peripheral devices.

EXPLOITING VIRTUAL WORKSTATION FUNCTIONALITY: Creating support platforms **-** Readying multiple operating systems - Suspending and resuming virtual workstations. **CONSTRUCTING A TEST ENVIRONMENT:** Accessing host files - Taking and restoring snapshots. **DEVELOPING TRAINING ENVIRONMENTS:** Protecting guest operating systems - Exploiting non-persistent disks.

L: 15; TOTAL: 15 PERIODS

REFERENCES

1. “Virtualization Overview “, https://www.vmware.com/pdf/virtualization.pdf
2. “VMware Workstation User’s Manual”, http://www.vmware.com/pdf/ws7_manual.pdf
3. “Guide to Deploying Virtual Appliances” , https://www.vmware.com/support/developer/studio/studio10/studio_userguide.pdf

HARDWARE AND SOFTWARE REQUIREMENTS

- **Operating System**: Windows 7, Linux (Ubuntu / CentOS / fedora / Linux Mint)
- **Software**: VMware Workstation, VMware Player, Oracle Virtual Box
- **Hardware:** RAM – 2 GB Minimum, 500 GB Storage.

15CS07L OPEN SOURCE PRIVATE CLOUD INFRASTRCUTURE DESIGN L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: Gain the knowledge necessary to plan, deploy and configure private cloud
CO2: Understand the building blocks of Eucalyptus private cloud
CO3: Deploy and configure application delivery to access private cloud

INTRODUCTION

Essential Characteristics - Service Models - Deployment models - Motivation for Migrating to Cloud Computing.

DESIGN AND IMPLEMENTATION

Eucalyptus: Major components - Node Controller (NC) - Cluster Controller (CC) - Walrus Storage Controller (WS3) - Storage Controller (SC) - Cloud Controller (CLC) - Dimensioning the hardware infrastructure - Topologies - Implementation on a single server - Implementation on two physical servers - Other possibilities for implementation – Network reconfiguration.

DEPLOYMENT

Credentials – Admin Console – User Console – VM Types and Configuration – Instance Creation – Security and Protocol Setup – Attaching Volumes – Attaching IP Address – launching instance – Access the instance – Hosting Application to an Instance – Elastic fox for Monitoring cloud instance

L: 15; TOTAL: 15 PERIODS

REFERENCES

1. ZoranPantic and Muhammad Ali Babar, "*Guidelines for Building a Private Cloud Infrastructure*", Technical Report, ITU, 2012.
2. http://opensourceforu.com/2014/03/build-private-cloud-eucalyptus/

HARDWARE AND SOFTWARE REQUIREMENTS

- **Operating System**: Linux (Ubuntu / CentOS / fedora / Linux Mint)
- **Software**: VMware Workstation, VMware Player, Oracle Virtual Box, Eucalyptus Cloud, elastic fox
- **Hardware:** RAM – 4 GB Minimum, 500 GB Storage

15CS08L EXPLORING BIGDATA MANAGEMENT TOOLS L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: Gain knowledge of schema less data storage and its importance

CO2: Manage and work with various big data processing tools

INTRODUCTION

Storage device characteristics: scalability – fast access – redundancy and availability – review of database concepts.

SCHEMA LESS DATA STORAGE

Need for schema less storage - NoSQL: Introduction - NoSQLvs RDBMS databases – MongoDB – Practice with MongoDB.

DISTRIBUTED DATA STORAGE

Hadoop Distributed File System (HDFS) - Components of Hadoop - Java interfaces to HDFS – Glance with map reduce.

DATA PROCESSING TOOLS

Pig Scripting - Hive – HCatolog – HiveQL.

L: 15; TOTAL: 15 PERIODS

REFERENCES

1. KrishtinaChodorow and Michael Dirolf, “MongoDB: The Definitive Guide”, 1st Edition, O'Reilley Media, 2010.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", 1st Edition, Addison-Wesley Professional, 2012.
3. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'Reilley Media Inc, 2012.

SOFTWARE REQUIREMENTS

Operating System: Windows / Linux (Ubuntu / CentOS / fedora / Linux Mint)

Software: Hadoop 20.0, MongoDB 3.4.0, Horton Works Data Platform sandbox (VM instance for Hadoop and ecosystem tools)

15CS09L **CREATIVE IMAGE MANIPULATION** **L T P C**
0 0 2 1

COURSE OUTCOMES

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

CO1: Understand image handling basics

CO2: Draw figures using tools and Create animations

List of Exercises

1. Exercises on GIMP Basics, text, colors etc
2. Exercises on Selection tools etc.
3. Cut out an image and insert in another picture.
4. Create Neon Glow effect
5. Exercises on TEXT Effects
6. Photo Manipulation
7. Create a text along the path
8. Create professional looking logo
9. Change or remove the background
10. Create an animation

P: 30; TOTAL: 30 PERIODS

SOFTWARE REQUIREMENT

- GIMP 2.3

15CS10L **3D ANIMATION** **L T P C**
0 0 2 1

COURSE OUTCOMES

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

CO1: acquire knowledge and skills in computer animation tool

CO2: develop 3D animation from modeling to rendering

Introduction to 3D Animation - Creating a 3D scene from primitives - Materials and Texturing - Cameras and lighting - Animation, Rendering, and Output Techniques - NURBS and spline - based modeling.

List of Exercises

1. Creating a 3D scene (Eg. metropolitan landscape) from primitives
2. Populate the scene with at least three new sculpted polygon objects. One of the objects should be a vehicle of some form.

3. Setup the animated scene for rendering. Render the scene out as a sequence of images and then import the sequence into the post compositing program for final QuickTime output
4. A single piece of paper dropping through the air
5. Stirring a soup pot and tasting from a spoon

P: 30; TOTAL: 30 PERIODS

REFERENCES

1. Autodesk Maya 2014 Essentials: Paul Naas
2. Blender Master Class -A Hands-On Guide to Modeling, Sculpting, Materials, and Rendering: Ben Simonds
3. Game Character Development with Maya: Antony Ward

SOFTWARE REQUIREMENT

- Autodesk Maya 2014

15CS11L	GAME PROGRAMMING	L T P C
		1 0 0 1

COURSE OUTCOMES

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

CO1: Understand the concepts of Game design and development.

CO2: exposed to the Core architectures of Game Programming.

3D GRAPHICS FOR GAME PROGRAMMING **7**

3D Transformations – Quaternions - 3D Modeling and Rendering - Ray Tracing – Lighting – Color – Texturing - Camera and Projections - Culling and Clipping - Character Animation - Scene Graphs.

GAME PROGRAMMING **8**

Game logic - Game views - managing memory - controlling the main loop - loading and caching game data.

L: 15; TOTAL: 15 PERIODS

TEXT BOOKS

1. Mike McShaffrfy and David Graham, “Game Coding Complete”, Fourth Edition, Cengage Learning, PTR, 2012.
2. Jason Gregory, “Game Engine Architecture”, CRC Press / A K Peters, 2009.
3. David H. Eberly, “3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics” 2nd Editions, Morgan Kaufmann, 2006.

15CS12L	EHR SECURITY	L T P C
		1 0 0 1

COURSE OUTCOMES

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

CO1: realize the importance of protecting patient health information.

CO2: understand the specific requirements regarding EHR privacy and security.

ELECTRONIC HEALTH CARE RECORDS (EHR) **6**

Understanding Patients’ Health Information Rights - Authorizations of Electronic Health Records - Ownership of HER

SECURING EHR DATA **6**

Security Risks in Office Based EHRs vs. Internet Hosted EHRs - Implementing a Security Management Process.

STANDARDS **3**

Case Study on USA HIPPA standards, EHR standards 2016 for India.

L: 15; TOTAL: 15 PERIODS

REFERENCES

1. Guidelines for EHR Standards 2016-India, Dec 2016.
2. National Health Portal, India. https://www.nhp.gov.in/data-privacy-and-security_mtl
3. Guide to Privacy and Security of Electronic Health Information, DH&HS, USA, April 2015
4. Meaningful Use Case studies for EHR, https://www.healthit.gov/providers-professionals/ehrs-improving-care-coordination-local-referral-network

15CS13L MOBILE INTEGRATED HEALTH CARE SYSTEMS **L T P C**
1 0 0 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Acquire knowledge on the development and characteristics of innovative healthcare systems and its importance.

An Introduction-Evaluation of Mobile, Mobile OS and Mobile Medical App Paradigms-Key components of MIH-Characteristics and Challenges of MIH-Medical Device Data System (MDDS)-Clinical Decision Support Systems- Integration of Mobile and MDDS-FDA regulated mobile medical apps-Applications: Guidance for Industry, Food and Drug Administration- Diet Controller App-Glucose Charter.

L: 15; TOTAL: 15 PERIODS

REFERENCES

1. Medstar, “Mobile integrated Health care: Approach to Implementation”, ISBN – 12: 9781449690168, 2016
2. Eric H. Beck, DO, NREMT-P, “Mobile Integrated Healthcare Practice: A Healthcare Delivery Strategy to Improve Access, Outcomes, and Value”, International Journal of Science and Technology, Chicago.
3. https://www.naemt.org/docs/default-source/MIH-CP/naemt-mih-cp-report.pdf

15CS14L CELLULAR AUTOMATA PARADIGM **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: Understand how surprisingly simple rules can lead to phenomenally complex and beautiful behaviors.

Introduction – Game-of-Life – Elementary Cellular Automata (CA) - Injectivity and surjectivity properties – Reversible CA - Details of one-dimensional CA – fractals, cycle lengths, algebraic properties - Totalistic CA - Additive CA - Classes of CA (I, II, III, IV) – Two dimensional CA.

L: 15; TOTAL: 15 PERIODS

REFERENCES

1. V. Z. Aladjev, 'Classical Cellular Automata. Homogeneous Structures', Fultus Corporation, 2010.
2. Andrew Ilachinski, 'Cellular Automata – A Discrete Universe', World Scientific Publishing Co. Ltd. 2002.
3. http://users.utu.fi/jkari/ca/
4. http://academic.regis.edu/dbahr/.

15CS15L ABSTRACT ALGEBRA L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: Understand how algebra allows us to abstract out the geometric objects such as groups, rings and fields .

CO2: Understanding of fundamental properties of groups, rings and fields as well as allows us to manipulate them in ways not possible directly.

Introduction to abstraction - Introduction to Groups - Properties of Finite Groups - Applications of Groups - Introduction to Rings - Properties of Finite Rings - Introduction to Fields - Applications of Finite Fields

L: 15; TOTAL: 15 PERIODS

REFERENCES

1. Thomas W. Judson, 'Abstract Algebra: Theory and Applications', Orthogonal Publishing, 2016.
2. Charles Pinter, 'A book of Abstract Algebra', Courier Corporation, 2010.

15CS16L TURING MACHINE SIMULATION AND COMPLEXITY THEORY L T P C
1 0 0 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: analyze complexity of decidable and undecidable problems

Definition of Turing Machine – Turing Machine Construction – Variants of Turing Machine – Decidability –Undecidability – Diagonalization – Simulation of Accepting Turing Machine – Introduction to complexity theory –Classes of P and NP – Reductions – NP-complete problems(3-SAT, CLIQUE)

L: 15; TOTAL: 15 PERIODS

REFERENCES

1. K.L.P. Mishra, NagasubramaniyanChandrasekaran, "Theory Of Computer Science: Automata, Languages And Computation" 3rd Edition, Printice Hall of India, 2008.
2. J.E. Hopcroft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory, Languages and Computations",
3. https://turingmachinesimulator.com.
4. http://morphett.info/turing/turing.html

15CS17L VEHICULAR CLOUD NETWORKING L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: appreciate the analogy and dissimilarity of cloud computing, Mobile cloud and vehicular ad hoc network. And understand the architecture, design principle, challenges, issues and applications of them. (K4)

CO2: create a vehicular cloud scenario by exporting real world road map from Open Street map using SUMO simulator. (S4)

Introduction to VANET - Cloud Computing - Mobile Cloud Computing - Vehicular Cloud Networking Architecture - Organization of Vehicular Cloud Computing - CaaS - INaaS - Design Principles - Operations - Services - Security - Privacy – Applications

Introduction to Simulation of Urban Mobility (SUMO) - packages - Installation - Vehicular Cloud Traffic Infrastructure Generation - Open Street Map - Export map - OSM to XML Conversion

L: 15; TOTAL: 15 PERIODS

REFERNCES

1. Farhan Ahmad, Muhammad Kazim and AsmaAdnane, “Guide to Security Assurance for Cloud Computing”, Springer Computer Communications and Networks, ISBN: 978-3-319-25986-4 (Print) 978-3-319-25988-8 (Online). Chapter 12:Vehicular Cloud Networks: Architecture and Security, 2015.
2. E. Lee, E. K. Lee, M. Gerla and S. Y. Oh, "Vehicular cloud networking: architecture and design principles," in IEEE Communications Magazine, vol. 52, no. 2, pp. 148-155, 2014.
3. KayhanZrarGhafoor, Kamalrulnizam Abu Bakar, Marwan Aziz Mohammed, Ali SafaSadiq and Jaime Lloret, “Vehicular Cloud Computing: Trends and Challenges”, ISBN: 9781466647817,URL:http://www.igi-global.com/chapter/vehicular-cloud-computing /90118, 2015.
4. http://www.sumo.dlr.de/userdoc/Networks/SUMO_Road_Networks.html

15CS18L EMBEDDED SYSTEMS DESIGN L T P C
0 0 2 1

COURSE OUTCOMES

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

CO1: acquire knowledge on embedded systems basics and describe the operations of processors

CO2: acquire embedded programming skills in Keil C environment.

Challenges of Embedded Systems – Embedded system design process - Embedded processors – Instruction sets and programming.

LIST OF EXERCISES

1. Write a program to receive the data serially
2. Write a program to convert packed BCD 0x29 to ASCII and Display the bytes on P1and P2.
3. Write a Program to Read inputs from switches and display on LCD.
4. Write a Program to make LEDs blink.
5. Write a Program to Read Switch status & scrolling the message.
6. Program for serial receive data echo using interrupt
7. Write a Program for encryption / decryption
8. Program to read Temperature value from ADC

P: 30; TOTAL: 30 PERIODS

REFERENCES

1. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", 2nd Edition, Pearson Education, 2013.
2. Wayne Wolf, "Computers as Components: Principles of Embedded Computer System Design", Elsevier, 2011.

SOFTWARE REQUIREMENT

- Keil C

15CS19L APP DEVELOPMENT USING ANDROID L T P C
0 0 2 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to:

CO1: appreciate the fundamentals and describe about Android programming.
CO2: understand and develop the mobile app using android

INTRODUCTION

Geo tag App - Introduction to Geo Tag –Application of Geo tag: Geo location and Landmark Recognition- Media Visualization.

NETWORKING APPLICATIONS

Social Networking Applications –Mapping Application-Tools and Technologies - Mobile App to Geo Tag – Case study:

GEO TAG APP

Bio user functionality -Bhuvan India POST –Implementing a simple Geo tag App

P: 30; TOTAL: 30 PERIODS

REFERECNCES

1. Schindler G, Krishnamurthy P, Lublinerman R, Liu Y, Dellaert F (2008) Detecting and matching repeated patterns for automatic geo-tagging in urban environments. In Proceedings of IEEE CVPR.
2. Billphilips ,Kristin and chris, "Android Programming",3rd edition,ISBN-13: 978-0134706054,2014.
3. http://chenlab.ece.cornell.edu/people/Andy/publications/GeoSurveyLuo_Joshi_Yu_Gallagher.pdf
4. http://www.vogella.com/tutorials/AndroidGoogleMaps/article.html

15CS20L PRACTICING TEST SUITES WITH SELENIUM IDE L T P C
0 0 2 1

COURSE OUTCOMES

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

CO1: Understand Selenium Architecture and its components.
CO2: Develop test scripting using open-source web based automation tool.

List of Exercises

1. **Introduction to Selenium**
2. **Selenium IDE**
    - Install Selenium IDE and FireBug
    - Introduction to Selenium IDE
    - Creating your First Selenium IDE script

- How to use Locators in Selenium IDE
- How to enhance a script using Selenium IDE

3. **WebDriver**

- Introduction to WebDriver & Comparison with Selenium RC
- Guide to install Selenium WebDriver
- Creating your First Script in Webdriver
- Accessing Forms in Webdriver
- Accessing Links & Tables using Selenium Webdriver
- Keyboard Mouse Events , Uploading Files - Webdriver

P: 30; TOTAL: 30 PERIODS

SOFTWARE REQUIREMENT

- Selenium WebDriver/ Selenium 2.0

15CS21L BUSINESS INTELLIGENCE SOLUTION DEVELOPMENT **L T P C**
0 0 2 1

COURSE OUTCOMES

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

CO1: Understand the Importance of data mining and its application in business.

CO2: Design, implement, manipulate, and manage multi-dimensional databases through SQL Server 2008 BI tools

List of Exercises

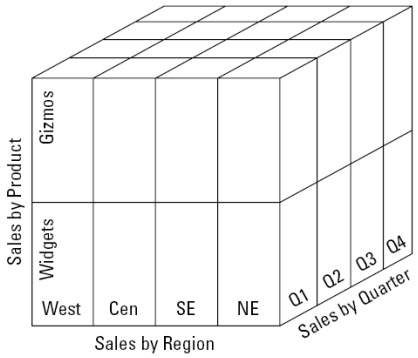
1) Installation and Configuration of database engines and analysis service with Sample
   - DataBases
     a) DataBase Engine creation
     b) Data source (DW_DB) integration
   - Executing simple and MDX queries

2) Creation of Multidimensional Data views in OLAP
   - Cube
   - Dimension table
   - Dimension
   - Hierarchy
   - Level
   - Fact table
   - Measure
   - Schema

3) Simple Case Studies

a. Build a BI user model to perform Quarterly productivity analysis on Factory Production Data for 4 consecutive years in 3 leading steel factories such as GAIL,Tata, JSW.

b. Create a 32 dimensional Sales_Cube to implement the following illustration of Sales by Product in a Country.



4) Presentation to Users - To turn a PowerPivot workbook into a data source for creating visual reports to users.

P: 30; TOTAL: 30 PERIODS

REFERENCE

1. Foundations of SQL server 2008 R2 Business Intelligence by Fouche Guy Langit Lynn,Apress,2nd Edition ,2011.

SOFTWARE REQUIREMENT

- Microsoft SQL Server 2008 R2 Express

B.E. - ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ONE CREDIT ELECTIVE COURSES (PEC)

S. No	Course Category	Course Code	COURSE TITLE	L	T	P	C	QP
1.	PEC	15EE01L	Computational Fluid Dynamics for Electrical Apparatus	1	0	0	1	G
2.	PEC	15EE02L	Design of Power Converters Laboratory	0	0	2	1	-
3.	PEC	15EE03L	Energy storage system	1	0	0	1	G
4.	PEC	15EE04L	LVDC wiring	1	0	0	1	G
5.	PEC	15EE05L	Digital substation	1	0	0	1	G
6.	PEC	15EE06L	Electrical system for smart building	1	0	0	1	G
7.	PEC	15EE07L	Power System Protection and Substation Automation	1	0	0	1	G
8.	PEC	15EE08L	Energy Laboratory	0	0	2	1	-
9.	PEC	15EE09L	HVDC circuit breakers	1	0	0	1	G
10.	PEC	15EE10L	Earthing design	1	0	0	1	G
11.	PEC	15EE11L	Electrical stress analysis	1	0	0	1	G
12.	PEC	15EE12L	Alternate insulating medium	1	0	0	1	G
13.	PEC	15EE13L	Communication technologies for smart grids	1	0	0	1	G
14.	PEC	15EE14L	Non-Conventional instrument Transformer	1	0	0	1	G
15.	PEC	15EE15L	Industrial Controllers Laboratory	0	0	2	1	-
16.	PEC	15EE16L	Soft Computing for Electrical Engineering Laboratory	0	0	2	1	-
17.	PEC	15EE17L	Electronics for safety critical system	1	0	0	1	G
18.	PEC	15EE18L	PCB design and fabrication	1	0	0	1	G
19.	PEC	15EE19L	Embedded System Laboratory	0	0	2	1	
20.	PEC	15EE20L	Techno commercial project proposal	1	0	0	1	G

15EE01L **COMPUTATIONAL FLUID DYNAMICS FOR ELECTRICAL APPARATUS** **L T P C 1 0 0 1**

COURSE OUTCOMES

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

CO1: describe the necessity and application of CFD.

CO2: explain the approximation of the physical problem.

COURSE CONTENT

Introduction to Computational Fluid Dynamics (CFD) - Necessity, Applications; Numerical Simulation Process - Approximate Solution Techniques - Mathematical Modeling, Navier-Stroke and Euler Equation - Solution of Navier Stroke Equation - Grid Generation - Finite Difference Method - Finite Volume Method - Finite Element Method.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. John D Anderson, “Computational Fluid Dynamics – The Basics with Applications”, Tata McGraw Hill, 2010.
2. T.J. Chung, “Computational Fluid Dynamics”, Cambridge University Press, London, 2010.

3. H.K. Versteeg and W. Malalasekara, “An Introduction to Computational Fluid Dynamics - The Finite Volume Method”, Pearson, 2nd Edition, 2008.
4. Jiyuan Tu, Guan Heng Yeoh and Chaoqun Liu, “Computational Fluid Dynamics: A Practical Approach”, Butterworth-Heinemann, 2007.

15EE02L DESIGN OF POWER CONVERTERS LABORATORY L T P C
0 0 2 1

COURSE OUTCOME

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

CO1: design and construct the various types of power converters

LIST OF EXPERIMENTS

1. Single phase controlled rectifiers.
2. Three phase controlled rectifiers.
3. Step-down and step-up dc choppers.
4. Buck/boost converters.
5. Single phase voltage source inverter.
6. Three phase voltage source inverter.
7. Ac voltage controllers.
8. Two stage sequence control of ac voltage controller.
9. Step up cycloconverter.
10. Step down Cycloconverter.

P: 30 TOTAL: 30 PERIODS

15EE03L ENERGY STORAGE SYSTEM L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: understand the operational mechanisms of each energy storage system

CO2: characterize and analyze electrochemical energy storages

COURSE CONTENT

Energy storage overview - Thermodynamics - Rechargeable Batteries and their Fundamental Electrochemistry - Li-ion Battery Technology and Challenges - Cathode and Anode Materials - Electrolytes - Fuel cell / regenerative fuel cell - Super-capacitor - Reaction kinetics - Electrochemical characterization - Introduction to Super Conducting Magnetic Energy Storage (SMES) operation - Load Leveling - Frequency Regulation - Power Quality - Applications.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Robert A. Huggins, “Energy Storage”, Springer Science and Business Media, 2010.
2. Ryan O’Hayre, Suk-Won Cha, Whitney Colella and Fritz B. Prinz, “Fuel Cell Fundamentals”, Wiley, 3rd Edition, 2016.
3. A.G. Ter-Gazarian, “Energy Storage for Power Systems”, 2nd Edition, IET Publications, 2011.

15EE04L **LVDC WIRING** **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: describe the fundamental knowledge in electrical engineering

CO2: prepare the details of estimation for residential and commercial electrical installations

COURSE CONTENT

Electrical symbols - DC Source (solar panel) - Voltage levels in DC supply - Types of storage device - DC Appliances : CFL, LED bulbs/TV, Vacuum cleaners, Computers, Mobile chargers, DC Ceiling fans(muffin fans), DC Refrigerators - DC wirings(PoE) - Switches and relays (solid state DC circuit breakers) - DC sockets - Safety practices – Advantages.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. S.L. Uppal, “Electrical Estimating and costing”, New Age International Pvt. Ltd., 2014.
2. J.B. Gupta, “Electrical Installation estimating and costing”, S. K. Kataria and Sons, New Delhi, 15th edition 2016.
3. Relevant IS Code for - Service Line Connection, Lying of Cable, Wiring Installation, National Building Code - Vol. 4.
4. https://www.allaboutcircuits.com/textbook/direct-current/
5. http://hackaday.com/2017/03/06/what-voltage-for-the-all-dc-house/
6. http://www.edn.com/electronics-blogs/dave-s-power-trips/4402704/How-do-we-get-to-a-DC-powered-home
7. http://chrisgammell.com/can-dc-power-an-entire-home/
8. http://www.backwoodssolar.com/when-to-use-dc-appliances
9. http://www.treehugger.com/sustainable-product-design/big-steps-in-building-change-our-wiring-to-12-volt-dc.html

15EE05L **DIGITAL SUBSTATION** **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: describe the architecture of a digital substation

CO2: explain the importance of intelligent electronic devices

COURSE CONTENT

Introduction to digital substation - Power system automation - Modern grid and substation automation - System architecture - Components of digital substation - IEC 61850 substation architecture - Intelligent Electronic devices - GOOSE - Station and process bus - GPS time clock - Merging units - Electronic fibre optic CT and VT - Substation communication and protocols - Working of a digital substation - Security threats - Advantages of digital substation.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Evelio Padilla, “Substation Automation Systems: Design and Implementation”, Wiley, 2015.
2. Cobus Strauss, “Practical Electrical Network Automation and Communication Systems”, Elsevier, 1st Edition, 2003.
3. http://myelectrical.com/notes/entryid/245/how-a-digital-substation-works
4. store.gedigitalenergy.com/faq/documents/general/iec61850.pdf

15EE06L ELECTRICAL SYSTEM FOR SMART BUILDING **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: understand the basic features of intelligent buildings

CO2: understand the operating principle and characteristics of various service Systems / technologies

COURSE CONTENT

Introduction to Intelligent Buildings - Basic Concepts - Intelligent Building Automation - Introduction to Smart Materials - HVAC (Heating, Ventilation And Air-Conditioning) Systems - Electrical Installations - Lighting Systems - Security and safety systems - Intelligent vertical transportation systems - Communication Systems - Structured cabling systems - Electrical Power Quality In Buildings - EMI/EMC Issues - Grounding Problems - Overview of Home/Building Automation - Case studies.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Derek Clements and Croome, “Intelligent Building Design, Management and Operations”, Thomas Telford Publishing, London, 2004.
2. Derek Clements and Croome, “Intelligent Buildings: An Introduction”, Routledge, 2014
3. Shengwei Wang**,** “Intelligent Buildings and Building Automation”, Spon Press, London, 2010.
4. P. Manolescue, “Integrating Security into Intelligent Buildings”, Cheltenharn, 2003.
5. Albert Ting – Pat So and Wai Lok Chan, “Intelligent Building Systems”, Kluwer Academic Publisher, U.S.A, 1999.
6. C. Ehrlich, “Intelligent Building Dictionary: Terminology for Smart, Integrated, Green Building Design, Construction, and Management” San Francisco, Calif: Hands-on-Guide, 2007.
7. www.ieindia.org,www.koetterfire.com,www.informit.com

15EE07L POWER SYSTEM PROTECTION AND SUBSTATION AUTOMATION **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: describe the protection schemes of electrical apparatus

CO2: explain the structure of substation automation system

COURSE CONTENT

Introduction to power system protection - Protection of generators and motors - Protection of transformers and reactors - Protection of transmission lines - Circuit breaker protection and monitoring - Introduction to substation integration and automation system - Functional architecture - Substation automation: Distributed structure, Centralized structure - Substation integration and automation technical issues.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Badri Ram and D. N.Vishwakarma, “Power System Protection and Switchgear”, Tata McGraw Hill, 2nd Edition, 2011.
2. Cobus Strauss, “Practical Electrical Network Automation and Communication Systems”, Elsevier, 1st Edition, 2003.
3. Evelio Padilla, “Substation Automation Systems: Design and Implementation”, Wiley, 2015.

15EE08L **RENEWABLE ENERGY LABORATORY** **L T P C**
0 0 2 1

COURSE OUTCOME

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

CO1: Design the renewable energy system for given application by collecting the field data.

LIST OF EXPERIMENTS

1. Design and estimation of solar radiation transmission through glazing materials in solar collector.
2. Design the solar photovoltaic systems and predict the array yield, final yield and performance ratio of the systems.
3. Design the battery backup system for domestic application by investigating the charging and discharging characteristics of battery.
4. Design the Anaerobic digester for organic waste generated from community buildings through research of literature.
5. Design the small scale wind energy systems for a location by collecting metrological data.
6. Design and investigate the performance of solar water heating system for the residential building.

P: 30 TOTAL: 30 PERIODS

15EE09L **HVDC CIRCUIT BREAKERS** **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: understand the modern trends used in HVDC circuit breakers

CO2: explain the characteristics of HVDC circuit breakers

COURSE CONTENT

Introduction to HVDC Circuit Breakers - Construction - Principle – Comparison between HVAC and HVDC Circuit Breakers - IGBT Based Switching - Switching Energy - Interruption of DC Current - Type of HVDC Circuit Breakers - Capability and Characteristics of HVDC Circuit Breaker - Requirements of HVDC Circuit Breakers – Applications, Advantages and Disadvantages of HVDC Circuit Breakers.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. K.R. Padiyar, “HVDC Power Transmission Systems”, New age international publications, 3rd Edition, 2017
2. P. Kundur, “P.S. Stability and Control”, Tata McGraw Hill, 1994
3. C.L. Wadhwa, “Electrical Power Systems”, New age International Pvt. Ltd., 6th Edition, 2010

15EE10L **EARTHING DESIGN** **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: describe the earthing system design

CO2: explain the various types of earthing in substations

COURSE CONTENT

Factors Influencing the Choice of Earthed and Unearthed Systems - System Earthing - Substation Earthing/Grounding - Power Frequency Earthing - High Frequency Earthing - Touch and Step Potential - Surge Phenomenon and Suppression Techniques - Earthing In Substations - Earthing Associated With Overhead Power Lines- Calculation of Earth Fault Currents - Measurement of Earth Resistivity, Electrode Resistance, Earth Loop Impedance.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Institute of Electrical and Electronics Engineers, IEEE Guide for Safety in AC Substation Grounding, IEEE standard 80 – 2000.
2. Maneesh Kumar and Gagandeep Singh, “Design of Grounding System for an Electrical Substation: An Overview”, International Journal of Scientific & Engineering Research, Vol. 5, No. 11, pp. 246-248, November 2014.

15EE11L ELECTRICAL STRESS ANALYSIS L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: apply the theoretical concepts of stress analysis for various electrical apparatus

CO2: prepare and solve model in FEA simulation software

COURSE CONTENT

Introduction to electrical stress analysis - Derivation of Basic Differential Equations - Stress Analysis on Resistor - Inductor - Capacitor - Diodes - Circuit Breaker - Op-amp, Potentiometer, Power Supply - Relay-Switch - Transistor - Bushing - Induction motor - Insulator - Transformer - Various Stress control techniques on electrical apparatus - Derating analysis - Factors affecting the component life - Failure mode analysis - Reliability prediction tools - Standards followed in different fields.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Matthew N.O. Sadiku, “Numerical Techniques in Electromagnetics”, Second Edition, CRC Press - Taylor & Francis, 3rd Edition, 2009.
2. Nicola Bianchi, “Electrical Machine Analysis Using Finite Elements”, CRC Press - Taylor & Francis, 2005
3. Sheppard J. Salon, “Finite Element Analysis of Electrical Machines”, Springer, 1995.
4. Titu I. Bajenescu and Marius I. Bazu, “Component Reliability for Electronic Systems”, Artech House, 2009.
5. http://www.sre.org/pubs/Mil-Hdbk-338B.pdf
6. http://www.ipc.org/3.0_industry/3.5_councils_associations/3.5.0_ipc/spvc/0607/ipc-9592-final-draft-0407.pdf

15EE12L ALTERNATE INSULATING MEDIUM L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: identify the various insulating materials

CO2: explain the structure of fluoroketone based gas mixture

COURSE CONTENT

Introduction to Insulating Medium - Overview of Solid, Liquid, Gas And Vacuum medium - Performance and Environmental Issues of Existing Dielectric Medium - Global warming potential (GWP) - Need For Alternate Insulating Medium - SF_6 - Advantages And Disadvantages - Identification Of New Gases - A Fluoroketone Based Gas Mixture - Properties - Dielectric Performance - Thermal Performance - Long-Term Behavior - Life-Cycle Assessment (LCA) - Benefits - Future Grid Carbon Footprint - alternate esteroids.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. P. Simka and N. Ranjan, "Dielectric Strength of C_5 Perfluoroketone," in 19th International Symposium on High Voltage Engineering, Pilsen, Czech Republic, 2015.
2. J. C. Devins, "Replacement gases for SF_6," IEEE Transactions on Dielectric Electrical Insulation, Vol. 15, pp. 81– 86, 1980.
3. ABB review 2016 in AirPlus™
4. Maik Hyrenbach, Tobias Hintzen, Pascal Muller and John Owens, "Alternative insulation gas for medium-voltage switchgear", 23rd International Conference on Electricity Distribution Lyon, June 2015.
5. J.D. Mantilla, N. Gariboldi, S. Grob and M. Claessens, "Investigation of the Insulation Performance of a New Gas Mixture with Extremely Low GWP", IEEE Electrical Insulation Conference, pp. 469-473, 2014.

15EE13L COMMUNICATION TECHNOLOGIES FOR SMART GRIDS L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: explain the communication channels and protocols for smart grid

CO2: describe the standards of smart grid communication

COURSE CONTENT

Introduction - Data communication -Communication channels - Communication/networking architecture - Smart Grid architecture - Internet based architecture - Power Line Communication architecture - Wireless Communication technologies - IEEE 802 series - Other issues in communication/networking - Challenges and research directions.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Janaka Ekanayake, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, and Nick Jenkins, "Smart Grid Technology and Applications", A John Wiley and Sons Ltd. Publication, 1st Edition, 2012.
2. James Momoh, "Smart Grid: Fundamentals of Design and Analysis", A John Wiley and Sons Ltd. Publication, 2012.
3. Jingcheng Gao, Wei Liang, Yang Xiao and C. L. Philip Chen, "A survey of communication/ networking in Smart Grids", Future Generation Computer Systems, Vol. 28, No. 2, pp. 391-404, February 2012.

15EE14L NON-CONVENTIONAL INSTRUMENT TRANSFORMER L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: describe the structure and operation of non conventional instrument transformer (NCIT)

CO2: explain the measurements in real time applications by non conventional instrument transformer (NCIT)

COURSE CONTENT

Introduction to NCIT - Need of NCIT - Comparison of conventional Instrumentation transformer and NCIT - NCIT structure - Extended Merging Unit - NCIT operation - Measurements: HV laboratory - real operation states - NCIT in gas insulated switchgear - Advantages of NCIT.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. ABB Product Guide: Difference between Sensors and conventional Instrument Transformers.
2. Non-conventional instrument transformers: Advanced GIS substations with IEC 61850-9-2 LE process bus.
3. IEEE PES ELK-CP 050602_R0-5.ppt : Non-Conventional Instrument Transformers.
4. Holger Heine, Patrice Guenther and Farel Becker, “New Non Conventional Instrument Transformer (NCIT) – A future technology in Gas Insulated Switch Gear”, IEEE Conference on Transmission and Distribution and Exposition (T&D), May 2016.
5. Jure Mocnik, Janez Huma and Andrej Zemva, “A non-conventional instrument transformer”, Measurement, Elsevier, Vol. 46, No. 10, pp. 4114-4120, December 2013.

15EE15L	INDUSTRIAL CONTROLLERS LABORATORY	L T P C
		0 0 2 1

COURSE OUTCOMES

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

CO1: articulate the PLC programming for Industrial processes

CO2: implement the performance of controller in DDC and DCS

LIST OF EXPERIMENTS

1. Design of Electronic On/Off controller with relay concept
2. Implementation of On Off controller using NI DAQ
3. Micro-processor based temperature control system
4. Batch process control by Programmable Logic Controller
5. PLC controlled level process
6. Reaction vessel control using Programmable Logic Controller
7. Traffic light control Using Programmable Logic Controller
8. Bottle filling system controlled by Programmable Logic Controller
9. Computer controlled Closed loop response of Temperature process
10. Computer controlled Closed loop response of pressure process
11. Monitor and Control of Temperature Process using SCADA with PLC
12. Implementation of Controller for Pressure and Temperature process in Distributed Control system
13. Automation of the Cement Plant, Sugar and Beverage Plant using Distributed Control system

P: 30 TOTAL: 30 PERIODS

15EE16L	SOFT COMPUTING FOR ELECTRICAL ENGINEERING LABORATORY	L T P C 0 0 2 1

COURSE OUTCOMES

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

CO1: implement various structures of ANN to system identification and control of linear and nonlinear systems

CO2: develop program with fuzzy relationship to control electrical drives
CO3: employ GA to power system optimization and control problems

LIST OF EXPERIMENTS

1. Implement Discrete Hopfield Network and Test for Input Pattern.
2. Implement Adaline with Bipolar Inputs and Outputs
3. Implement Back Propagation Network for a Given Input Pattern.
4. Implement Composition of Fuzzy and Crisp Relations.
5. Perform max-min composition of two matrices obtained from cartesian product.
6. System identification using neural network
7. Controlling linear and nonlinear dynamic systems using neural network
8. Short term load forecasting using neural network
9. Implement the fuzzy logic controller for motor drives
10. Economic dispatch problem using GA
11. Load scheduling problem using GA
12. Unit commitment problem using GA
13. PID controller tuning using GA
14. System identification using GA

P: 30 TOTAL: 30 PERIODS

15EE17L ELECTRONICS FOR SAFETY CRITICAL SYSTEM L T P C
1 0 0 1

COURSE OUTCOMES

Upon the successful completion of this course, the students will be able to,
CO1: describe the standards of safety critical system
CO2: explain the development of electronics and software tools with respect to safety critical system

COURSE CONTENT

Introduction to safety critical system - Need for safety critical systems - Integrity level and standard for safety critical system - Specification and Design - Verification - Commercial and Industrial Standards for Electrical Appliances - Grounding Techniques in Electrical / Electronics, ESD Protection, Need of Redundancy in Critical Applications to Avoid Risks - Single point failures-Elimination of Hazard / Risk Analysis - Basics of Reliability Analysis - Fault tree analysis - Failure mode effective analysis.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. An Introduction to Safety Critical Systems, www.qa-systems.com
2. G.R. Nisha, “A model driven approach for design and development of a safety critical system”, IEEE 2011 3rd International Conference on Electronics Computer Technology (ICECT) - Kanyakumari, India, 2011.
3. Ashok N. Srivastava and Johann Schumann, “Software Health Management: A Necessity for Safety Critical Systems”, Journal of Innovations in Systems and Software Engineering, Vol. 9, No. 4, pp. 219-233, 2013.
4. MIL STD 217 / 217 Plus, MIL STD 1629, for Reliability and FMEA / FMECA.

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15EE18L **PCB DESIGN AND FABRICATION** **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: design and analyze the Printed Circuit Boards fabrication

CO2: develop the Printed Circuit Boards and discuss the factors affecting PCB performance

COURSE CONTENT

Introduction to PCB design - Basics of hardware and software - Types of PCB, terminologies, PCB Layers - Different tools and software used for PCB designing - Different circuit on PCB design software - Creating a new project Building parts and symbols - Schematic of Different circuits - Creating multi-sheet flat designs - PCB layout and 3D Imaging - Introduction to Proteus and OrCAD Capture - Placement of components and Routing - Assigning reference designators - Design Rules checking - Adding inter sheet signal references - PCB stackup preparation-Characteristics impedance calculation-Signal Integrity analysis - Creating a Bill of Materials and Print layout - Gerber generation - PCB fabrication methods - Soldering Methods.

L: 5 P: 20 TOTAL: 25 PERIODS

REFERENCES

1. Charles Hamilton, “A Guide to Printed Circuit Board Design” Elsevier, 2013.
2. Kraig Mitzner, “Complete PCB Design Using OrCAD Capture and PCB Editor” Newnes Publications, 2009.
3. Christopher T. Robertson, “Printed Circuit Board Designer's Reference” Prentice Hall Professional, 2004.
4. Eric Bogatin, “Signal integrity analysis simplified”, Prentice Hall Modern Semiconductor Design Series, 2012.
5. http://www.ece.ucsb.edu/Faculty/Johnson/ECE189/Mentor2007/
6. http://read.pudn.com/downloads120/ebook/509920/High-speed%20Digital%20Design%20-%20Johnson%20&%20Graham.pdf

15EE19L **EMBEDDED SYSTEM LABORATORY** **L T P C**
0 0 2 1

COURSE OUTCOMES

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

CO1: interface GPIO, Timer, and ADC with external peripherals along with interrupt concept.

CO2: utilize serial communication protocols like UART, SPI and I^2C

LIST OF EXPERIMENTS

1. Program to interface on chip GPIO with external LED’s and switches
2. Program to control three different DC motors with different timings using delay routines and OnChip timers separately and compare both
3. Program to interface an Analog sensor with processor through OnChip ADC and display the measurement at external LCD.
4. Program to establish serial communication between two I^2C compatible boards
5. Program to establish serial communication between two UART compatible boards
6. Program to establish serial communication between two SPI compatible boards

P: 30 TOTAL: 30 PERIODS

15EE20L	TECHNO COMMERCIAL PROJECT PROPOSAL	L T P C 1 0 0 1

COURSE OUTCOMES

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

CO1: determine the technical feasibility and financial viability of the project

CO2: assess the risk associated with the project and enumerate imminent actions that are required to be taken

COURSE CONTENT

Introduction - Gathering Background Information - Components of a Proposal - Executive Summary - Statement of Need - Project Description - Methods - Staffing/Administration - Evaluation - Sustainability - Budget - Support and Revenue Statement - Budget Narrative - Organizational Information and Conclusion - Case studies.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Jane C. Geever, "The Foundation Center's Guide to Proposal Writing", New York: The Foundation Center, 6th Edition, 2012.
2. Ellen Karsh and Arlen Sue Fox, "The Only Grant-Writing Book You'll Ever Need", Basic Books, 4th Edition, 2014.
3. http://grantspace.org/

B.E. - ELECTRONICS AND INSTRUMENTATION ENGINEERING

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

ONE CREDIT ELECTIVE COURSES (PEC)

S. No	Course Category	Course Code	COURSE TITLE	L	T	P	C	QP
1.	PEC	15EI01L	PLC Programming	0	0	2	1	-
2.	PEC	15EI02L	Programming in ARDUINO	0	0	2	1	-
3.	PEC	15EI03L	Control system using Graphical Programming	0	0	2	1	-
4.	PEC	15EI04L	DCS Fundamentals & Industrial communication protocols*	1	0	0	1	G
5.	PEC	15EI05L	Embedded system design using ARM microcontroller	0	0	2	1	-
6.	PEC	15EI06L	Hands on Training using FPGA	0	0	2	1	-
7.	PEC	15EI07L	Graphical Programming for Electronic Circuits	0	0	2	1	-
8.	PEC	15EI08L	Soft Computing Techniques using Fuzzy and Neural Network	0	0	2	1	-
9.	PEC	15EI09L	Instrumentation Detail Engineering*	1	0	0	1	G
10.	PEC	15EI10L	Virtual Graphical Programming for beginners	0	0	2	1	G
11.	PEC	15EI11L	Field Instruments for Process control*	1	0	0	1	G
12.	PEC	15EI12L	Instrumentation in Cement Industries*	1	0	0	1	G
13.	PEC	15EI13L	Clinical Laboratory Instrumentation*	1	0	0	1	G

15EI01L PLC PROGRAMMING L T P C
0 0 2 1

COURSE OUTCOMES

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

CO1: develop PLC program for simple automation applications.

CO2: interface electrical drives and sensors with PLC.

LIST OF EXPERIMENTS

1. Develop the function block diagram for logic gates
2. Develop the function block diagram for traffic light control system
3. Develop the function block diagram for bottle filling system
4. Develop the function block diagram for batch process
5. Develop the function block diagram for motor control
6. Develop the function block diagram for temperature control
7. Design and develop the signal condition circuits for electrical appliance
8. Interfacing the signal conditional circuit and driver circuit with PLC

P: 30 TOTAL: 30 PERIODS

REFERENCE

1. Petruzella, “Programmable Logic Controller”, McGraw Hill, 3rd Edition, 2009.

15EI02L PROGRAMMING IN ARDUINO **L T P C**
0 0 2 1

COURSE OUTCOMES

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

CO1: apply the basic programming to monitor and indicate the process variable.

CO2: apply the basic programming to control real time process.

LIST OF EXPERIMENTS

1. Introduction to ARDUINO
2. LED Blinking Waves
3. Automatic control of Temperature process
4. Traffic light control
5. Voltage and Temperature Indicator
6. Robot path control
7. Robot Arm position control
8. Home appliances control using IR remote
9. MATLAB and Arduino interface (Hardware in loop)
10. Temperature logging system
11. Introduction to IOT

P: 30 TOTAL: 30 PERIODS

REFERENCE

1. https://www.arduino.cc/

15EI03L CONTROL SYSTEM USING GRAPHICAL PROGRAMMING **L T P C**
0 0 2 1

COURSE OUTCOMES

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

CO1: outline the fundamentals of LabVIEW

CO2: explain the concepts of design techniques in Time domain and Frequency domain

LIST OF EXPERIMENTS

1. Create simple logics using VI
2. Mathematical models of electrical system
3. Closed loop response for a given transfer function
4. Root locus analysis and design for a given transfer function
5. Open and closed loop sinusoidal frequency analysis and design
6. Study the characteristics of linear system
7. Stability analysis of feedback system

P: 30 TOTAL: 30 PERIODS

REFERENCE

1. Norman S Nise, “Control systems Engineering” Willey, 6th Edition, 2012.

15EI04L DCS FUNDAMENTALS & INDUSTRIAL COMMUNICATION PROTOCOLS **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: explain the basic concepts of DCS and its Interfacing.

CO2: describe knowledge of various communication protocols.

CONTENT

DCS Hardware studies - implementation using functional logic: Basic logic gate, Model of cement, beverage plant - Automation of pressure process using DCS.

HART communication Protocol - Communication modes – HART networks – HART commands – HART applications. Field bus: Introduction – General Field bus architecture – CAN bus for automation – PROFI bus – MOD bus

One day Industrial Visit

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Michael P. Lukas, "Distributed Control System", Van Nostrand Reinhold Co., Canada, 2001.
2. Lawrence M Thompson, "Industrial Data Communications" 4th Edition, ISA-The Instrumentation, Systems and Automation Society.

15EI05L	EMBEDDED SYSTEM DESIGN USING ARM MICROCONTROLLER	L T P C 0 0 2 1

COURSE OUTCOMES

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

CO1: develop programs in LPC2148

CO2: design interfacing applications in ARM7 processors

LIST OF EXPERIMENTS

1. Study of ARM evaluation system
2. Interfacing ADC and DAC.
3. Interfacing LED and generation of PWM signal.
4. Interfacing real time clock and serial port.
5. Interfacing keyboard and LCD.
6. Interfacing EPROM and interrupt.
7. Interrupt performance characteristics of ARM and FPGA.
8. Interfacing stepper motor and temperature sensor.
9. Implementing zigbee protocol with ARM.

P: 30 TOTAL: 30 PERIODS

15EI06L	HANDS ON TRAINING USING FPGA	L T P C 0 0 2 1

COURSE OUTCOMES

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

CO1: synthesis, simulate and develop schematic of various digital combinational circuits using FPGA on Xilink simulator.

CO2: develop interfacing application using FPGA

LIST OF EXPERIMENTS

1. Study of Synthesis tools Half and full adder
   - Decoder – 2 x 4, 3 x 8
   - Priority encoder.
   - Ripple adder.
   - 4 – Bit ripple counter.
   - Code conversion

   All the above synthesis in three modeling styles - data flow, structural and behavioral

2. Study of Simulation using tools Half adder
   - Multiplexer – 2 x 1, 4 x 1
   - Demultiplexer – 1 x 2, 1 x 4

   All the above synthesis in three modeling styles - data flow, structural and behavioral
3. Study of Simulation using tools Flipflop – D, T
   - Priority encoder.
   - Ripple adder.
   - 4 – Bit ripple counter.

   All the above synthesis in three modeling styles - data flow, structural and behavioral
4. Study of development tool for FPGAs for schematic entry and verilog
   - Full adder, half adder.
   - Demultiplexer – 1 x 2, 1 x 4.
5. Design and simulation of pipelined serial / parallel adder to add/ subtract 8 number of size, 12 bits each in 2's complement.
6. Place and Root and Back annotation for FPGAs
7. Design and simulation of back annotated verilog files for multiplying two signed, 8 bit numbers in 2's complement.
8. Study of FPGA board and testing on board LEDs and switches using verilog code.
9. Design a Realtime Clock (2 digits, 7 segments LED displays each for HRS., MTS, and SECS.) and demonstrate its working on the FPGA board. to display binary number on the FPGA.
10. Design of traffic light controller using verilog tools . Movement of vehicles in any direction or pedestrian in any direction.

P: 30 TOTAL: 30 PERIODS

REFERENCES

1. Stephen Brown and Zvonko Vranesic Mc graw Hill, “Fundamentals of Digital Logic wht Verilog design”, Mc Grew, 2003.
2. Bhasker, J., VHDL Primer, Prentice Hall 1995
3. Zainalatsedin Navabi, ‘VHDL Analysis and Modelling of Digital Systems’, 2nd Edition, Tata McGraw Hill, 1998.
4. Douglas Perry, ‘VHDL Programming by example’, Tata McGraw Hill, 3rd Edition, 2003.

15EI07L GRAPHICAL PROGRAMMING FOR ELECTRONIC CIRCUITS L T P C
0 0 2 1

COURSE OUTCOMES

Upon successful completion of the course, the students will be able to

CO1: Build multisim circuits.
CO2: Experiment with different application of Diodes, Transistors and Op-Amps
CO3: Infer fundamental concepts of semiconductor devices working and their characteristics

LIST OF EXPERIMENTS

1. Introduction to Multisim
2. Design of Regulated Power Supply using Diodes.
3. Design of Voltage regulator using Zener Diode.
4. Fundamentals of Transistor-VI characterisitics, Simple applications.
5. Biasing Circuits, Amplifier circuits.
6. Design of Power amplifier circuits.
7. Design of Single stage and Multistage amplifier circuits.
8. Fundamentals of Fet and its Applicationts.
9. Design of Oscillator circuits-RC phase shift and Wein Bridge
10. Design of Square waveform circuits-Multivibrator and Schmitt trigger

11. Fundamentals of Op-Amp and simple circuits of Op-Amp.

P: 30 TOTAL: 30 PERIODS

REFERENCES

1. Introduction to Electronics-Multisim lab manual by National Instruments
2. Electronic Devices-Thomas L Floyd.

15EI08L	SOFT COMPUTING TECHNIQUES USING FUZZY AND NEURAL NETWORK	L T P C 0 0 2 1

COURSE OUTCOMES

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

CO1: describe the concept of fuzzy and neural network.

CO2: develop Matlab coding for fuzzy and neural network.

Fuzzification, defuzzification techniques, Fuzzy knowledge and rule bases. . Implementation of fuzzy logic controller using Matlab fuzzy-logic toolbox. Case studies: FIS in matlab environment - tipper, washing machine and Temperature control.

Concept of Artificial Neural Networks ,Neural Network based controller Matlab-neural network toolbox. Neural-Network interconnection systems. Case studies: NN in matlab environment for clustering and classification problems.

P: 30 TOTAL: 30 PERIODS

REFERENCES

1. J.S.R.Jang, C.T.Sun and E.Mizutani, ‘ Neuro- Fuzzy and Soft Computing’ Pearson Education, New Delhi, 2004
2. Jacek M. Zurada, ‘Introduction to Artificial Neural Systems’, Jaico Publishing home, 2002.
3. John Yen and Reza Langari, ‘Fuzzy Logic – Intelligence, Control and Information’, Pearson Education, New Delhi, 2003.
4. Robert J.Schalkoff, ‘ Artifical Neural Networks’, McGraw Hill, 1997.

15EI09L	INSTRUMENTATION DETAIL ENGINEERING	L T P C 1 0 0 1

COURSE OUTCOMES

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

CO1: explain the basic concept of the piping and instrumentation diagrams.

CO2: describe the standards used in industries for different applications.

CONTENTS

1. Process Flow diagrams
2. What is a P&ID-How to read P&ID
3. Standards and symbols
4. Indications on P&ID
5. Conventions in P&ID
6. Instrumentation Standards
7. Loop diagram - Data sheet preparation
8. Hook up diagram
9. Cable schedule
10. Instrument index
11. Selection and sizing of instruments-
12. Selection and sizing of valves-
13. Project Management.

One day Industrial Visit

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Instrumentation symbols and identification, ISA 5.1
2. Process Measurement Instrumentation API RP 551

15EI10L VIRTUAL GRAPHICAL PROGRAMMING FOR BEGINNERS L T P C
0 0 2 1

COURSE OUTCOMES

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

CO1: express the need of Graphical programming.(K2)
CO2: explain the hardware and software involved in programming techniques of VI. (K2)
CO3: describe the basics of Arrays, Graphs and structures in VI. (K2)

Need for Virtual Instrumentation- Virtual instrumentation through LabVIEW- Software Environment palettes- Data Types- Dataflow Programming- Debugging Technique.

Creating Sub VI and Express VI as Icons- Creating Sub VI from section of VI- Expandable Nodes- Creating a Standalone Application- Looping- Shift Registers- Feedback Nodes- Control Timing- Interval- Timed Structure- Timing Sources- Execution and priority

Numeric Type- Strings- Array- Initializing Array – Polymorphism - Clusters- Cluster Control and indicators - Cluster Functions and Operations- Types of Waveform- Waveform Charts and Graphs- Customizing Charts and Graphs- Special Planes on Graphs- Structures- Case Structure- Sequence Structure- Timed Structure- Event Structure- Special VI- Math Script- Formula Node.

P: 30 TOTAL: 30 PERIODS

REFERENCES

1. Ronald W. Larsen 2010, Labview for Engineers: International Version, 1st Edition, Pearson.
2. Gary W. Johnson, Richard Jennings 2006, LabVIEW Graphical Programming, McGraw-Hill Professional
3. Jeffrey Travis, Jim Kring 2006, *LabView for Everyone*, Prentice Hall PTR.

15EI11L FIELD INSTRUMENTS FOR PROCESS CONTROL L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: describe the working principles and installation procedures of field instruments.(K3)
CO2: discuss the control valve performance and safety devices. (K2)

Differential pressure transmitter- DP transmitter construction and its behaviour- applications – inferential measurement application- 2-3-4 wire temperature transmitter- Temperature switch- magnetic type flow meters with flow transmitter- Level transmitters in Hydrostatic interface and boiler drum level control.

Control Valves Performance – Dead Band – Actuator positioner Design – Selection of Control Valve based on flow characteristics - Solenoid Valves -Pressure Relief Valves/Bursting Discs -On/Off Valve

Actuators -Choke Valves -HVAC Actuators- Conveyor safety devices - Pull chord switch , Belt sway switch , Slow speed switch -Vibration Field Instruments -Fire & Gas Detectors

One day Industrial Visit

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Bela G Liptak-Instrument Engineers Handbook Process Measurement and Analysis- Vol-I, 3rd Edition, CRC Press.
2. Tony R. Kuphaldt – Lesson in Industrial Instrumentation, Vol-I.
3. Douglas O.J desa – Instrumentation Fundamentals for Process Control, Taylor & Francis, 2nd Edition, 2001.

15EI12L INSTRUMENTATION IN CEMENT INDUSTRIES L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: explain fundamental concepts of Sensors, Protocols & Automation.
CO2: Outline the concepts on Cement production and quality control.

Cement manufacturing process-Sensors :Temperature, Pressure, Level, Flow–Calibration of Sensors-Industrial Protocols-Fundamentals of PLC,SCADA,DCS -Bagging Process-Gas Analysers: SOx,NOx-Cement Quality Analysers.

One day Industrial Visit

L: 15 TOTAL: 15 PERIODS

15EI13L CLINICAL LABORATORY INSTRUMENTATION L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: Explain the principle of operation of biomedical instruments with their widespread use and requirements. (K2).
CO2: Select Instrument for a particular analysis with idea of its merits, demerits and limitations. (K3).

CONTENTS

Clinical Laboratory Instruments: Colorimeters, Spectrophotometers, Clinical Flame Photometers, Electrophoresis, Electronic devices for measuring blood characteristics, Chromatography-GC & HPLC, Blood cell counters, Clinical thermometer probes, Measurement of Heart rate & Pulse rate.
Albumin analyzer, Bench top clinical chemistry analyzer, Bilirubinimeter, Cardiac marker analyzer, C-Reactive protein analyzer, Co-oximeter, Osmometer, Immuno turbidmetric analyzer, Measurement of body temperature using AD590 / LM34, Urine chemistry analyzer.

One day Industrial Visit

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Handbook of Biomedical Instrumentation – by R.S.Khandpur, 3rd Edition, Tata McGraw Hill, 2014.
2. Biomedical Transducers and Instruments – by Tatsuo Togawa, Toshiyo Tamura and P. Ake Oberg, CRC Press, 1997.

3. Biomedical Instrumentation and Measurements – by Leslie Cromwell, Fred J Weibell and Erich A. Pfeiffer, Prentice-Hall India Pvt. Ltd, 2010.
4. Introduction to Biomedical Equipment Technology- Joseph J.Carr, 4th Edition, Pearson education ltd, 2000.
5. Biomedical Equipment: Use, Maintenance & Management - Joseph J.Carr, Fascimile edition, Prentice Hall, 1991.

B.Tech. - INFORMATION TECHNOLOGY

DEPARTMENT OF INCORMATION TECHNOLOGY

ONE CREDIT ELECTIVE COURSES (PEC)

S. No	Course Category	Course Code	COURSE TITLE	L	T	P	C	QP
INDUSTRY COLLOBORATIVE COURSES								
1.	PEC	15IT01L	Agile Development Process	1	0	0	1	G
2.	PEC	15IT02L	Microsoft Analytics	1	0	0	1	G
3.	PEC	15IT03L	HTML5and CSS3 mobile programming	0	0	2	1	-
4.	PEC	15IT04L	Web services for mobile programming	0	0	2	1	-
5.	PEC	15IT05L	E-Learning Platform	0	0	2	1	-
OTHER COURSES								
6.	PEC	15IT06L	Computer Hardware and Trouble Shooting	0	0	2	1	-
7.	PEC	15IT07L	PHP Programming	0	0	2	1	-
8.	PEC	15IT08L	Programming in python	1	0	0	1	G
9.	PEC	15IT09L	Theory of Computation	1	0	0	1	G
10.	PEC	15IT10L	Basics of Compiler Design	1	0	0	1	G
11.	PEC	15IT11L	Virtualization	1	0	0	1	G
12.	PEC	15IT12L	Programming in Ruby	0	0	2	1	
13.	PEC	15IT13L	Social Media Application Development	1	0	0	1	G
14.	PEC	15IT14L	iOS Development with swift 2.0	1	0	0	1	G
15.	PEC	15IT15L	E-Commerce Security	1	0	0	1	G
16.	PEC	15IT16L	Computer Animation	0	0	2	1	-
17.	PEC	15IT17L	Hadoop Architecture and Installation	0	0	2	1	-
18.	PEC	15IT18L	Microcontroller and Raspberry Pi	1	0	0	1	G

15IT01L AGILE DEVELOPMENT PROCESS L T P C
1 0 0 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Describe the fundamental principles and practices associated with agile development methods. (K1)

LIST OF CONTENTS

1. Agile Methodology
2. Agile Models in Software Development & Testing
3. SCRUM Process Framework
4. KANBAN Process Framework
5. Software Development using SCRUM
6. Software Testing using KANBAN

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Robert C.Martin, “Agile Software Development, Principles, Patterns, and Practices”, Pearson New International publication, First Edition, 2013.
2. Ken Schwaber, Mike Beedle,”Agile Software Development with Scrum”, First Edition, Van Haren Publishing, 2001.

15IT02L **DATA ANALYTICS** **L T P C**
0 0 2 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Design, implement, populate and query relational databases for operational and informational data. (K3)

LIST OF CONTENTS

1. Fundamentals of Analytics
2. Typical Analytics Application Structure
3. Microsoft Analytics Solution (OLAP) Model
4. Creating Database using Microsoft SQL Server
5. Creating DataMart using Microsoft SQL Server
6. Creating Employee Analytics (OLAP) using Microsoft Analytics Server
7. Understanding Dimensions and Measures in Microsoft Analytics
8. Understanding MDX Queries
9. Samples of Analytical Reporting

L: 30 TOTAL: 30 PERIODS

REFERENCES

1. Buck Woody, Danielle Dean, Debraj GuhaThakurta, Gagan Bansal, Matt Conners, Wee-Hyong Tok," Data Science with Microsoft SQL Server 2016",Microsoft publisher, 2016.
2. Stacia Varga, Denny Cherry, and Joseph D'Antoni," Introducing Microsoft SQL Server 2016: Mission-Critical Applications, Deeper Insights, Hyperscale Cloud, Microsoft publisher,2016.

15IT03L **HTML5 and CSS3 MOBILE PROGRAMMING** **L T P C**
0 0 2 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Develop client side intensive mobile applications using HTML5 family technologies. (K3)

LIST OF CONTENTS

1. Fundamentals of Mobile Programming.
2. Introduction to HTML5.
3. Introduction to CSS3.
4. Typical Mobile App Model using HTML5 and CSS3.
5. Creating a Mobile App using HTML5 and CSS3.
6. Deployment of Mobile App on Android and IOS platforms.

P: 30 TOTAL: 30 PERIODS

REFERENCES

1. Oswald Campesato, "jQuery, CSS3, and HTML5 for Mobile and Desktop Devices: A Primer", Mercury Learning and Information, 2014.
2. Jake Carter," HTML5 Mobile Web Development", O'Reilly Media publisher, 2010.

15IT04L **WEB SERVICES FOR MOBILE PROGRAMMING** **L T P C**
0 0 2 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: recognize and use the core standards related to programming of Web services for Mobile environments.(K2)

LIST OF CONTENTS

1. Introduction to Web services Concept
2. Create a Web service using ASP.NET C#
3. Testing Web service
4. Deploying Web service
5. Role of Web service in Mobile App
6. Calling Web service from Mobile App
7. Penetration Testing

P: 30 TOTAL: 30 PERIODS

REFERENCES

1. DT Editorial Services,"Mobile Application Development Black Book", Dreamtech Press, 2015.
2. https://www.cs.cmu.edu/~bam/uicourse/830spring09/BFeiginMobileApplicationDevelopment

15IT05L	E-LEARNING PLATFORM	L	T	P	C
		0	0	2	1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Develop E-learning applications comprising of all latest innovative education Methodologies and assessment techniques. (K3)

LIST OF CONTENTS

1. Introduction to E-Learning
2. Typical E-Learning Application Model
3. E-Learning Content Creation & Management
4. E-Learning Content Delivery
5. E-Learning Courses Management
6. E-Learning Participants Management
7. E-Learning Assessments

P: 30 TOTAL: 30 PERIODS

REFERENCES

1. https://www.talentlms.com/elearning/elearning-101-jan2014-v1.1.pdf.
2. www.efrontlearning.net .
3. www.talentlms.com.

15IT06L	COMPUTER HARDWARE AND TROUBLE SHOOTING	L	T	P	C
		0	0	2	1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: classify and explain the working of different computer hardware components. (K2)

CO2: perform diagnostic procedures and troubleshooting techniques. (K3)

LIST OF CONTENTS

1. **PC Hardware Overview**
   Basic Parts of PC, System board, Microprocessor, Interrupts, DMA, SMPS, BIOS, POST sequence, System configuration, Memory, Mass storage, I/O interface standards.

2. **Bus Standards and Networking**
   ISA, PCI, SCSI, IDE, USB, Network Interface Cards, Cables and connectors, MODEM

3. **Installation and Preventive Maintenance**
   System Configuration, Installation Practice, PC Assembling and Integration, Virus, data Recovery

4. **Troubleshooting & Tools**
   Troubleshooting problems of system boards, add on cards and peripherals.

P:30 TOTAL: 30 PERIODS

REFERENCES

1. Michael Meyers,"Introduction to PC Hardware and Troubleshooting", McGraw Hill Publisher, First Edition, 2003.
2. Kyle McRae, Gary Marshall," Computer Troubleshooting: The Complete Step-by-step Guide to Diagnosing and Fixing Common PC Problems", Second Edition, 2008.
3. Govindarajalu.B, "IBM PC AND CLONES: Hardware, Troubleshooting and Maintenance", Tata McGraw-Hill, 2011.

15IT07L **PHP PROGRAMMING** **L T P C**
0 0 2 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Develop PHP programs to build interactive, data-driven sites with Database connectivity. (K3)

LIST OF CONTENTS

1. History
2. Web Brower
3. Web - Server, Xampp
4. Installation and Configuration files
5. Variable Types
6. Constants
7. Function
8. Arrays
9. Date & Time, Image Uploading
10. WEB FEATURES: Sessions,Forms,GET and POST data, Cookies,HTTP Headers
11. Database Programming
12. AJAX
13. Error handling in PHP
14. File handling in PHP

P: 30 TOTAL: 30 PERIODS

REFERENCES

1. W.J.Gilmore "A Programmer's Introduction to PHP4.0", Apress, 2001.
2. W.Jason Gilmore," Beginning PHP and MySQL", Fifth Edition, Apress, 2014.

15IT08L **PROGRAMMING IN PYTHON** **L T P C**
0 0 2 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Recognize and construct common programming idioms: variables, loop, branch, subroutine, and input/output. (K2)

CO2: Develop programs to solve real-world problem using the language idioms, data structures and standard library. (K2)

LIST OF CONTENTS

1. Python object types-Numeric types-Strings
2. Lists-dictionaries-files-tuples
3. Functions and generators
4. Statements, expressions, variables
5. Functions, logic, conditionals
6. DB Connectivity, Event-driven programming, local/global variable
7. Lists, keyboard input, the basics of modeling motion

P: 30 TOTAL: 30 PERIODS

REFERENCES

1. Mark lutz, “Learning Python”, Fifth Edition, O’Reilly, 2013.
2. Steven F. Lott, “Building Skills in Object-Oriented Design”,Steven F. Lott publisher, 2009.
3. Steven F. Lott, “Building Skills in Python”, 2010.

15IT09L THEORY OF COMPUTATION L T P C
1 0 0 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Explain the basics of finite automata and their capabilities. (K1)

CO2: Construct and prove the equivalence of languages described by pushdown automata and context free grammars. (K3)

LIST OF CONTENTS

1. **Regular Expressions and Finite Automata**
   Regular Expression - FA and Regular Expressions - Finite Automata (FA) - Deterministic Finite Automata (DFA) - Non-deterministic Finite Automata (NFA) - Finite Automata with Epsilon transitions.

2. **Context free Languages and push down automata**
   Context-Free Grammar (CFG) - Parse Trees - Definition of the Pushdown automata - Languages of a Pushdown Automata - Equivalence of Pushdown automata and CFG - Deterministic Pushdown Automata - Normal forms for CFG - Pumping Lemma for CFL

3. **Turing machines and undecidability**
   Turing Machines - Programming Techniques for TM - Un-decidable problems about Turing Machine

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. J.E. Hopcroft, R. Motwani and J.D. Ullman, “Introduction to Automata Theory, Languages and Computations”, Third Edition, Pearson Education, 2007.
2. Anil Maheshwari, Michiel Smid, “Introduction to Theory of Computation” E-book, 2016.

15IT10L BASICS OF COMPILER DESIGN L T P C
1 0 0 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Analyze the source program and recognize the tokens.(K4)

CO2: Compare the various types of parser and their role for the design of compiler. (K2)

LIST OF CONTENTS

1. **Lexical Analysis**
   Representation of tokens and regular expression - Token reorganization and finite state automata

2. **Syntax Analysis**
   Parser and its types - Top-down parser - Bottom-up parser

3. **Intermediate code generation**
   Intermediate code generation- Need for Intermediate code - Types of Intermediate code - Representation of all language constructs by three-address code - Grammar symbols and attributes - Semantic routines for intermediate code generation - Directed Acyclic Graph

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. K.Muneeswaran, “Compiler Design”, Oxford University Press, 2013.
2. Alfred Aho, Monica S.Lam, Ravi Sethi and Jeffrey D.Ullman, “Compiler Principles, Techniques and Tools”, 3rd Edition, Addison Wesley, 2006.

15IT11L	VIRTUALIZATION	L T P C
		1 0 0 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Describe the fundamental concepts of server and client virtualization. (K2)

CO2: Create application by utilizing cloud platforms such as Google app Engine and Amazon Web Services (AWS). (K3)

LIST OF CONTENTS

1. **Introduction to Cloud Computing**
   Cloud Computing in a Nutshell, Roots of Cloud Computing, Layers and Types of Cloud, Features of a cloud, Infrastructure-as-a-Service, Software-as-a-Service, Platform-as-a-Service, Google App Engine, Microsoft Azure;, Amazon EC2; Challenges and Risks.

2. **Cloud Technologies Hypervisor**
   Introduction,Types of Hypervisor. Virtualization Technology: Virtual machine Technology, virtualization applications in enterprises.

3. **Network storage**
   Network Attached Storage (NAS), Storage Area Network (SAN), Network Virtualization, Server Virtualization, Pitfalls of virtualization.

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Rajkumar Buyya, James Broberg , Andrzej M. Goscinski, “Cloud Computing: Principles and Paradigms”, John Wiley & Sons, First Edition, 2011.
2. Mitch Tulloch with Nigel Cain, Alvin Morales, Michel Luescher, Damian Flynn , “Microsoft System Center: Building a Virtualized Network Solution”, Microsoft Press, 1st edition, 2014.

15IT12L	PROGRAMMING IN RUBY	L T P C
		0 0 2 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Develop server-side Ruby scripts for publishing on the Web. (K3)

LIST OF CONTENTS

1. Classes,objects and Variables
2. Expressions,Exceptions,I/O
3. Containers,Blocks and iterators
4. Threading
5. Ruby and web
6. Networking
7. Meta programming- Basics

P: 30 TOTAL: 30 PERIODS

REFERENCES

1. Dave Thomas, Chad Fowler and Andy Hun, “Programming Ruby 1.9(The Pragmatic Programmers' Guide)”,3rd edition, The Pragmatic Bookshelf,North Carolina Dallas, Texas, 2009.
2. Dave Thomas, “The Ruby ObjectModel and Meta programming”, The Pragmatic Bookshelf,North Carolina Dallas, Texas, 2009.

15IT13L SOCIAL MEDIA APPLICATION DEVELOPMENT **L T P C**
1 0 0 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Explain various concepts in developing Social Media Applications. (K2)

LIST OF CONTENTS

1. Overview of Graph theory
2. Strong and Weak Ties
3. Positive and Negative Relationships
4. Evolutionary Game Theory
5. Modeling Network Traffic using Game Theory
6. Auctions
7. Markets and Strategic Interaction in Networks
8. Bargaining and Power in Networks
9. Information Cascades
10. Power Laws
11. Cascading Behavior in Networks

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Easley D. Kleinberg J., “Networks, Crowds, and Markets – Reasoning about a Highly Connected World”, Cambridge University Press,2010.
2. Jackson, Matthew O., “Social and Economic Networks”, Princeton University Press, 2008.

15IT14L iOS DEVELOPMENT USING SWIFT 2.0 **L T P C**
0 0 2 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Define key programming terms relevant to Swift and iOS programming. (K2)

CO2: Explain and summarize iOS API features.(K2)

LIST OF CONTENTS

1. **Swift**
   Introduction- Control- Function and closure-Class and structure

2. **iOS**
   User Interactivity - Multiple View Controllers & Navigation -webservice

3. **Persistence & Networking**
   Introduction to Developing for tvOS –Location- Locomotion and Motion

P: 30 TOTAL: 30 PERIODS

REFERENCES

1. Vandad Nahavandipoor, “iOS 8 Swift Programming Cookbook Solutions & Examples for iOS Apps”, O'Reilly Media, 2014.
2. Boisy G. Pitre, “Swift for Beginners: Design and Development”, PEACHPIT PRESS, 2013.
3. Christian Keur and Aaron Hillegass, “IOS Programming: The Big Nerd Ranch Guide -Big Nerd Ranch Guides”, 4th Edition, 2011.

15IT15L	E-COMMERCE SECURITY	L T P C
		1 0 0 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Discuss security issues in online forums and services.(K2)

CO2: Describe various security techniques to secure client computers.(K2)

LIST OF CONTENTS

1. Online Security Issues- Overview
2. Security for Client Computers
3. Communication Channel Security
4. Security for Server Computers
5. Organizations that provide Computer Security
6. Payment Systems for Electronic Commerce
7. Online Payment Basics
8. Digital Wallets
9. Internet Technologies and the Banking Industry
10. Criminal Activity and payment systems: Phishing and Identity Theft

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Gray P. Schneider, “Electronic Commerce”, Course Technology, Cengage Learning, USA, 10th Edition, 2012.
2. Anup K. Ghosh,”E-Commerce Security and Privacy (Advances in Information Security)”, Springer, 2001.

15IT16L	COMPUTER ANIMATION	L T P C
		0 0 2 1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: explain and demonstrate procedural approaches in 2D & 3D computer animation.(K2)

CO2: demonstrate the use of animation, digitized sound, video control, and scanned images.(K4)

LIST OF CONTENTS

1. Introduction & Learning perspective drawing - Drawing for Animation: Gesture Drawing, Action Drawing, Line of action

2. 2D, 3D Design concepts & Composition.
3. Principles of Animation.
4. Process film making & Editing Tools (Adobe After Effect CS6 ,Cyber link power director)
5. Editing & Animatics.
6. Input Sound - Sound Effects – Sound Recording.

P: 30 TOTAL: 30 PERIODS

REFERENCES

1. Andy Chong, “Basics Animation: Digital Animation”, Ava Publishing, Vol: 2, 2007.
2. Rick Parent,” Computer Animation”, Morgan Kaufmann publisher, 2012.

15IT17L HADOOP ARCHITECTURE AND INSTALLATION

L	T	P	C
0	0	2	1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: Install and build a Hadoop cluster capable of processing large data. (K6)

CO2: Monitor the file system, job progress, and overall cluster performance. (K4)

LIST OF CONTENTS

1. Hadoop Architecture
2. Installing Ubuntu with Java 1.8 on VM Workstation 11
3. Hadoop Versioning and Configuration
4. Single Node Hadoop 1.2.1 installation on Ubuntu 14.4.1
5. Multi Node Hadoop 1.2.1 installation on Ubuntu 14.4.1
6. Linux commands and Hadoop commands1.8. Cluster architecture and block placement
7. Pseudo Distributed Mode
8. Fully Distributed Mode
9. Master Daemons(Name Node, Secondary Name Node, Job Tracker)
10. Slave Daemons(Job tracker, Task tracker)
11. Task Instance
12. Hadoop HDFS Commands
13. Accessing HDFS
14. CLI Approach
15. Implementation of Map/Reduce using Java

P:30 TOTAL: 30 PERIODS

REFERENCES

1. https://www.tutorialspoint.com/hadoop/hadoop_tutorial.pdf.
2. Tom White,“Hadoop: The Definitive Guide, Storage and Analysis at Internet Scale”,O'Reilly Media / Yahoo Press, Third Edition, 2012.

15IT18L MICROCONTROLLER AND RASPBERRY PI

L	T	P	C
1	0	0	1

COURSE OUTCOMES

Upon Completion of this course, the students will be able to

CO1: describe the architecture and applications of microcontroller.(K2)

CO2: describe the functionality of raspberry Pi and its interfacing(K2)

LIST OF CONTENTS

1. Introduction to microcontroller- Architecture of 8051 Microcontroller.
2. Instruction sets and Addressing modes.

3. Signals and I/O ports, Timers and interrupt.
4. Interfacing -keyboard, LCD, ADC & DA. Applications- Stepper motor- Power plant control, Traffic light controller
5. Raspberry Pi
6. HDMI output
7. Connection with VGA, VIM text editor
8. Switch relay ,Servo Control ,GUI interface
9. Simple Arduino application

L: 15 TOTAL: 15 PERIODS

REFERENCES

1. Kenneth J.Ayala, “The 8051 microcontroller Architecture, Programming and applications” Third Edition, Minneapolis West Pub, 2005.
2. Eben Upton, Gareth Halfacree, “Raspberry Pi User Guide” ,Third Edition ,Wiley, 2014.

B.E. - CIVIL ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING

ONE CREDIT ELECTIVE COURSES (PEC)

S. No	Course Category	Course Code	COURSE TITLE	L	T	P	C	QP
1.	PEC	15CE01L	Recent advancements in special concretes	1	0	0	1	G
2.	PEC	15CE02L	Design of Foundation Elements	1	0	0	1	G
3.	PEC	15CE03L	Earth Retaining Structures	1	0	0	1	G
4.	PEC	15CE04L	Traffic Engineering and safety	1	0	0	1	G
5.	PEC	15CE05L	Bridge construction methods	1	0	0	1	G
6.	PEC	15CE06L	Decentralized waste water treatment system	1	0	0	1	G
7.	PEC	15CE07L	Building marking	1	0	0	1	G
8.	PEC	15CE08L	Introduction to GIS	1	0	0	1	G
9.	PEC	15CE09L	Introduction to timber structures	1	0	0	1	G
10.	PEC	15CE10L	Earthquake Resistance consideration for RC Buildings as per Indian Standard	1	0	0	1	G
11.	PEC	15CE11L	Seismic evaluation and retrofitting of structures	1	0	0	1	G
12.	PEC	15CE12L	Tunneling Techniques	1	0	0	1	G
13.	PEC	15CE13L	Soil contamination and remediation	1	0	0	1	G
14.	PEC	15CE14L	Environmental noise Pollution and control	1	0	0	1	G
15.	PEC	15CE15L	Safety In Construction	1	0	0	1	G

15CE01L **RECENT ADVANCEMENTS IN SPECIAL CONCRETE** **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: Explain the suitability of special concrete making materials and testing methods. (K2)

CO2: Outline the properties of special concrete and its applications. (K2)

COURSE CONTENTS

Ultra High Strength – High Performance Concrete –Fibre Reinforced Polymer – Polymer Concrete – Polymer Infiltrated concrete – Applications of Special concrete – Applications of Fibre reinforced concrete – Aerated Concrete – Sulfur and Sulfur Impregnated concrete – Bacterial Concrete – Recycled Aggregate Concrete –Nano Materials for concrete - Testing Methods.

L: 15, TOTAL: 15 PERIODS

TEXT BOOKS

1. Shetty M.S., “Concrete Technology”, S.Chand& Company, New Delhi, 2008
2. Santhakumar. A.R, “Conrete Technology”, Oxford university press, 2007
3. M.L. Gambhir, “Concrete Technology”, Tata Mc-Graw Hill Company, Noida, 2011.

REFERENCES

1. Orchard D.F., “Concrete Technology”, Vol I &II ,1998
2. Neville A.M “Properties of Concrete”, Pearson Education, 2008
3. “Construction and Building Materials” Elsevier Publications.
4. “Cement and Concrete Research, Elsevier Publications.

15CE02L DESIGN OF FOUNDATION ELEMENTS L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: Design Shallow Foundation (K2)

CO2:DesignDeep Foundation (K2)

COURSE CONTENTS

Design of Piles- Design of Pile caps- Design of Raft Foundation – Design of Well Foundation

L: 15, TOTAL: 15 PERIODS

TEXT BOOKS

1. UnnikrishnaPillai, S., DevdasMenon, “Reinforced Concrete Design”, Tata McGraw-Hill Publishing Company Limited, New Delhi 2009.
2. Varghese, P.C., “Advanced Reinforced Concrete Structures”, Prentice Hall of India Private Limited, New Delhi, 2007.

REFERENCES

1. Mallick, D.K. and Gupta A.P., “Reinforced Concrete”, Oxford and IBH Publishing Company, 2007
2. Krishna Raju, N., “Design of RC Structures”, CBS Publishers and Distributors, Delhi, 2006
3. Ram Chandra.N. andVirendraGehlot, “Limit State Design”, Standard Book House, 2004.

15CE03L EARTH RETAINING STRUCTURES L T P C
1 0 0 1

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to

CO1: Explain the concept of lateral earth pressure in soil (K3)

CO2: Design a suitable earth retaining structure (K3)

COURSE CONTENTS

Introduction – State of stress in retained soil mass – Earth pressure theories – Classical and graphical techniques– Earth pressure due to external loads, empirical methods - Wall movement – Retaining structures-Types of sheet piles - Analysis and design of cantilever and anchored sheet pile walls - Design of anchor systems- Introduction to reinforced earth.

L: 15, TOTAL: 15 PERIODS

TEXT BOOKS

1. Clayton, C.R.I., Militisky, J. and Woods, R.I., Earth pressure and Earth-Retaining structures, 3rd Edition, Survey University Press, 2014.
2. Das, B.M., "Principles of Geotechnical Engineering", 8th Edition, The PWS series in Civil Engineering, 2015.

REFERENCES

1. Militisky, J. and Woods, R., "Earth and Earth retaining structures", Routledge,1992
2. Day, R.W., "Geotechnical and Foundation Engineering: Design and Construction", McGraw Hill, 1999.

15CE04L	TRAFFIC ENGINEERING AND SAFETY	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Explain the reasons of accidents and their preventive measures (K2)

COURSE CONTENTS

Traffic volume count, methods of traffic volume count, Manual, mechanical, videography, passenger car unit. Presentation of traffic volume count. Speed studies, spot speed studies speed and delay studies and its presentation .Origin and destination studies. Necessity of parking studies types of parking off street parking, on street parking, Accident studies, causes of accidents, accident records condition and collision diagram, preventive measures

L: 15, TOTAL: 15 PERIODS

TEXT BOOKS

1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2014.
2. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2000.

REFERENCES

1. Indian Roads Congress (IRC) specifications: Guidelines and special publications on Traffic Planning and Management
2. Guidelines of Ministry of Road Transport and Highways, Government of India.
3. SubhashC.Saxena, A Course in Traffic Planning and Design, DhanpatRai Publications, New Delhi, 1989.
4. Transportation Engineering – An Introduction, C.JotinKhisty, B.KentLall, Prentice Hall of India Pvt Ltd, 2006.

15CE05L	BRIDGE CONSTRUCTION TECHNIQUES	L	T	P	C
		1	0	0	1

COURSE OUTCOMES

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

CO1: Explain the concepts of bridge construction techniques (K2)

COURSE CONTENTS

Complete Scaffolding –span by span construction - Balanced Cantilever - Push (incremental) launching – box pushing – Prefabrication techniques.

L: 15, TOTAL: 15 PERIODS

TEXT BOOKS

1. Johnson Victor D., “Essentials of Bridge Engineering”, Oxford and IBH Publishing Company, New Delhi, 6th Edition 2015.
2. Rajagopalan,N “Bridge Superstructure”, Alpha Science International, 2006

REFERENCES

1. Phatak D.R., “Bridge Engineering”, SatyaPrakashan, New Delhi, 1990.
2. Ponnuswamy S., “Bridge Engineering”, Tata McGraw-Hill, New Delhi, 2007.

15CE06L	DECENTRALISED WASTEWATER TREATMENT SYSTEM (DEWATS)	L T P C 1 0 0 1

COURSE OUTCOMES

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

CO1: Outline the basic concepts of waste water treatment (K2)

CO2: Illustrate the components of onsite sanitation (K2)

COURSE CONTENTS

Introduction – Types of waste water – Pollution - Waste water treatment – Biological Treatment – Aerobic & Anaerobic Process – Suspended and Attached growth -Centralized and Decentralized waste water treatment system – Domestic waste water quality and quantity - Control Parameters – Dewats Components – Grease trap and Grit chamber - Septic tank – Imhoff tank – Anaerobic baffle reactor – Anaerobic filter – Planted soil filter – Horizontal gravel filter – Vertical sand filter – Ponds – Anaerobic and Aerobic ponds – Hybrid and Combined systems.

L: 15, TOTAL: 15 PERIODS

TEXT BOOKS

1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers, New Delhi, 2014.
2. Soli. J Arceivala, “Waste water Treatment for Pollution Control and Reuse”, McGraw Hill Education, 2006.

REFERENCES

1. Metcalf and Eddy “Wastewater Engineering – Treatment andReuse”, Tata McGraw Hill, New Delhi, 2003.
2. Ludwig Sasse“DEWATSDecentralised wastewater treatment system in developing countries”, Borda, 1998.

15CE07L	BUILDING MARKING	L T P C 1 0 0 1

COURSE OUTCOMES

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

CO1: Marking the load bearing structures (K2)

CO2: Marking the framed structures (K2)

COURSE CONTENTS

Study of building plan - Centre line method – Marking of load bearing structures – Marking of framed structures-Marking for plumbing and electrical lines

L: 15, TOTAL: 15 PERIODS

TEXT BOOKS

1. S.C. Rangawala, “Engineering materials”, Charotar Publishing House, New Delhi.2000.
2. Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, Dhanpat Rai and Sons, 1997.

REFERENCE

1. Edward Allen and Joseph Iano, “Fundamentals of Building Construction”, John willey & sons, 2009

15CE08L **INTRODUCTION TO GIS** **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: Outline the basic concepts of GIS and DBMS (K2)

CO2: Apply GIS software in Civil Engineering field (K2)

COURSE CONTENTS

Introduction – GIS definition – basic components of GIS – standard GIS softwares – Data type – Spatial and non-spatial (attribute) data – measurement scales – Data Base Management Systems (DBMS) - Data models – vector and raster data – data compression – data input by digitization and scanning – attribute data analysis – integrated data analysis – Modeling in GIS Highway alignment studies – Land Information System.

L: 15, TOTAL: 15 PERIODS

TEXT BOOKS

1. Lillesand, T.M., Kiefer, R.W. and J.W.Chipman, “Remote Sensing and Image Interpretation”, 5th Edition, John Willey and Sons (Asia) Private Limited, New Delhi. PP: 763, 2004.
2. Anji Reddy, M., “Remote Sensing and Geographical Information System”, 2nd Edition, BS Publications, Hyderabad, 2001.

REFERENCES

1. Lo. C.P.andA.K.W.Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall of India Private Limited, New Delhi, Pp: 492., 2002.
2. Peter A.Burrough, Rachael A.McDonnell, “Principles of GIS”, Oxford University Press, 2000.

15CE09L **INTRODUCTION TO TIMBER STRUCTURES** **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: Explain the basic concepts of Timber Design (K2)

COURSE CONTENTS

Design process and structural loads - Timber building terminology (e.g. building systems) - Properties of timber and engineered wood products-General timber design principles - Design of bending, tension and compression members - Design of members under combined loads - Case Study of Existing Timber Structures.

L: 15, TOTAL: 15 PERIODS

TEXT BOOKS

1. Ram S Gupta, “*Principles of Structural Design: Wood, Steel, and Concrete, Second Edition*” Taylor & Francis (publisher), 2014.
2. Donald E. Breyer and Kelly Cobeen,”*Design of wood structures-asd/lrfd (p/l custom scoring survey)*” McGraw-Hill, 2014.

REFERENCES

1. Donald Breyer, Kenneth Fridley, Pollock Jr., Kelly Cobeen,”*Design of Wood Structures-ASD/LRFD*”, McGraw Hill Professional, 2014.

2. AbiAghayere, Vigil, *"Structural Wood Design - ASD/LRFD, Second Edition*", Taylor & Franchis (publisher), 2016.
3. Wood Design Manual 2010"
4. "Introduction to Wood Design 2011"

15CE10L EARTHQUAKE CONSIDERATIONS AS PER INDIAN STANDARDS L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: To discuss code provisions and their application on different types of structures (K2)

COURSE CONTENTS

Structural modeling of multistoried RC buildings – planar models - space frame and reduced 3D models -application of lateral load - analysis of building frames under lateral load. Earthquake resistant design Concepts – virtues of EQR design - capacity based design - design of shear wall and frame members as per IS13920:1993 – Ductile detailing of frame members and shear walls.

L: 15, TOTAL: 15 PERIODS

TEXT BOOKS

1. Pankaj Agarwal and Manish ShriKhande, Earthquake Resistant Design of Structures, Prentice - Hall of India, New Delhi, 2003.
2. S.K. Duggal, Earthquake resistant design of structures, Oxford University Press, New Delhi-1.

REFERENCE

1. Bullen K.E., Introduction to the Theory of Seismology, Great Britain at the University Printing houses, Cambridge University Press 1996

15CE11L SEISMIC EVALUVATION AND RETROFITTING L T P C
1 0 0 1

COURSE OUTCOMES

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

CO1: To discuss retrofitting of Seismic Damages (K2)

COURSE CONTENTS

Push over Analysis- Earthquake Disaster Analysis – Seismic Retro fitting

L: 15, TOTAL: 15 PERIODS

TEXT BOOKS

1. Pankaj Agarwal and Manish ShriKhande, Earthquake Resistant Design of Structures, Prentice - Hall of India, New Delhi, 2003.
2. S.K. Duggal, Earthquake resistant design of structures, Oxford University Press, New Delhi-1.

REFERENCE

1. Bullen K.E., Introduction to the Theory of Seismology, Great Britain at the University Printing houses, Cambridge University Press 1996

15CE12L **TUNNELING TECHNIQUES** **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: To discuss about provisions and application of tunneling techniques (K2)

COURSE CONTENTS

Site investigations , Geotechnical Considerations of tunneling - Design of Tunnels - Construction & Excavation methods , soft ground tunnels , Rock tunnels - Micro tunneling techniques, Tunnel support design - Ventilation of tunnels , tunnel utilities , safety aspects

L: 15, TOTAL: 15 PERIODS

TEXT BOOKS

1. J O Bickel & T R Kuesel "Tunnel Engineering Handbook", CBS, 2nd Edition, 2004
2. R. Srinivasan "Harbourand Dock and Tunnel", Charotar Publishing House, 28th Edition 2016.

15CE13L **SOIL CONTAMINATION AND REMEDIATION** **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: Explain the soil-chemical interaction mechanism (K2)

CO2: Explain various methods in soil stabilization (K2)

COURSE CONTENTS

Role of Geo-environmental Engineering–soil pollution -factors influencing soil-pollutant interaction – modification of index, chemical and engineering properties – physical and physio-chemical mechanisms – Environmental laws and regulations - Transport of contaminant in subsurface – characterization of contaminated sites – In-situ contamination– soil remediation.

L: 15, TOTAL: 15 PERIODS

TEXT BOOKS

1. Daniel B.E, Geotechnical Practice for waste disposal, Chapman & Hall, London, 2012.
2. Hari D. Sharma and Krishna R.Reddy, Geo-Environmental Engineering – John Wiley and Sons, INC, USA, 2004.
3. Ott, W.R., Environmental Indices, Theory and Practice, Ann Arbor, 1978.

REFERENCES

1. Lagrega, M.D., Buckingham, P.L., and Evans, J.C., Hazardous Waste Management,, McGraw Hill, Inc. Singapore, 1994.
2. Daniel, D. E. Geotechnical Practice for Waste Disposal. London: Chapman and Hall, 1993.
3. Westlake, K., Landfill Waste pollution and Control, Albion Publishing Ltd., England, 1995

15CE14L **NOISE POLLUTION AND CONTROL** **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: Outline the basic concepts of noise pollution (K2)

CO2: Illustrate the components of noise pollution mitigations. (K2)

COURSE CONTENTS

Characterization of Noise from Construction, Mining, Transportation and Industrial Activities, Airport Noise – General Control Measures – Effects of noise pollution – auditory effects, non-auditory effects. Designing out Noise – Industrial Noise Control – effects of noise on workers efficiency - Acoustic quieting - mechanical isolation technique, acoustical absorption, constrained layer damping – OSHA Noise standards – public education – other non legislative measures.

L: 15, TOTAL: 15 PERIODS

TEXT BOOK

1. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers, New Delhi, 2014.
2. S.K.Agarwal., Noise pollution APH Publishing corporation, 2005

REFERENCES

1. Peterson and Gross .E Jr., "Hand Book of Noise Measurement", 7th Edn, 2003.
2. Antony Milne, "Noise Pollution: Impact and Counter Measures", David & Charles PLC, 2009.
3. OSHA Standards for noise pollution (OSHAwebsite) (https://www.osha.gov/SLTC/noisehearingconservation/index.html)

15CE15L **SAFETY IN CONSTRUCTION** **L T P C**
1 0 0 1

COURSE OUTCOMES

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

CO1: Explain the Causes of accidents and principles selecting, operations, inspection and testing of various construction machinery. (K2)

COURSE CONTENTS

Problems impeding safety in construction industry- causes and types of accidents, construction regulations - design aids for safe construction.- Fall protection in construction OSHA 3146 – OSHA requirement for working at heights, Safe access and egress. - Cranes inspection checklist - builder's hoist, winches, chain pulley blocks – use of conveyors – concrete mixers, concrete vibrators – safety in earth moving equipment, excavators, dozers, loaders, dumpers, motor grader, concrete pumps, welding machines, use of portable electrical tools, drills and grinding tools- demolition work - manual, mechanical, pre survey inspection, method statement, site supervision, safe clearance - health hazards - Indian standard – Fire hazards in demolition.

L: 15, TOTAL: 15 PERIODS

REFERENCES

1. Hudson, R."Construction hazard and Safety Hand book" , Butter Worth's, 1985.
2. Jonathan D.Sime, "Safety in the Built Environment", London, 1988.