

**Solapur University, Solapur****Ph.D. Course Work Syllabus****Paper I– Research Methodology and Information****Communication Technology****(Common Paper for Faculty of Engineering & Technology)**

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Examination scheme: Theory paper: 100 marks (3 hrs duration)

**Unit 1 - Basics of Research**

Definition, objectives, motivation, types of research and approaches: descriptive research, conceptual, theoretical, applied and experimental.

**Unit 2 - Formation of Research Problem**

Research Process: To determine what type of research to be done, plan of research work, Selection of research area, prioritization of research.

Literature review: importance and methods, sources.

Objectives and scope of work, Developing Research Plan and Schedule: Scheduling Constraints, steps, problems in scheduling, limitations.

**Unit 3 - Mathematical Modeling and Simulation**

a) Modeling: Concept of modeling, classification of mathematical models, modeling with ordinary differential equations, difference equations, partial differential equations, graphs.

b) Simulation: Concept, types (quantitative, experimental, computer, fuzzy theory, statistical) processes of formulation of model based on simulation. Variables and measurement.

**Unit 4 - Experimental Modeling**

a) Definition of experimental design, examples, single factor experiments blocking and nuisance factors, guidelines for designing experiments.

b) General model of process: Input factors/ variables, Output parameters / variables controllable / uncontrollable variables, dependent / independent variables, experimental validity.

c) Introduction to Risk assessment, reliability, sustainability, and uncertainty

## **Unit 5 - Analysis of data**

Types of data: parametric and nonparametric, descriptive and inferential data, collection of data: normal distribution, calculation of co-relation coefficient.

Data processing: Analysis, error analysis, meaning, different methods. Analysis of variance, significance of variance, analysis of covariance, multiple regressions, testing linearity / nonlinearity of model, testing adequacy of model. Introduction to data handling using software.

## **Unit 6 - Research Deliverables**

Various forms of publications: Thesis, paper, research proposal.

Thesis writing: Introduction, Literature Review or State-of-the-art, Research approach (methodology), Results or findings, discussions, conclusions, scope for future work, references and appendices.

Presentation: Poster, thesis, proposal, and paper.

## **Unit 7 - Components of Information Communication Technology (ICT)**

Impact factor, e-information

Patents: Agencies, National /International, procedure for filing, e-submission.

International publications: notes, letters/communications, full papers Review, h-index, Citation index.

## **Reference Books**

1. C. R. Kothari, "Research Methodology", Willy Estern Ltd. ND.
2. Wayne Goddard and Stuart Melville, "Research Methodology-An Introduction", Juta & Co, Ltd, 2006
3. Lucienne T.M. Blessing, Amaresh Chakrabarti, "DRM, a Design Research Methodology," Springer-Verlag London Limited 2009
4. Yogesh Kumar Singh, "Fundamentals of Research Methodology and Statistics," NEW AGE INTERNATIONAL (P) LIMITED, PUBLISHERS
5. Douglas Montgomery, "Design of Experiments"
6. Willkinston K.P. L., Bhandarkar, "Formulation of Hypothesis", Himalaya publishing, Mumbai.
7. Schank Fr, "Theories of Engineering Experiments", Tata McGraw Hill
8. Role of ICT in Doctoral Research- Capt. Dr. Nitin Sonaje, Aurther Press- New Delhi

Solapur University, Solapur  
Electronics Engineering  
(Faculty of Engineering & Technology)  
Syllabus for Ph.D. Course Work - Revised



<i>Paper</i>	<i>Subject</i>	<i>Examination Scheme Theory paper</i>
I	Research Methodology & Information Communication Technology	100 Marks
II	Advances in Electronics Engineering	100 Marks
III	Elective – Advanced Development in Electronics Engineering	100 Marks

Elective –

1. Advances in Image Processing
2. Advanced CMOS VLSI Design
3. Soft Computing Paradigms

*Note – 1. Candidate shall select an elective in consultation with guide from any of below Ph.D. course work-*

- a. Electronics Engineering*
- b. Electronics & Telecommunication Engineering*
- c. Computer Science & Engineering*

Solapur University, Solapur  
Ph.D. Course Work - Revised  
Electronics Engineering  
(Faculty of Engineering & Technology)



Paper I– Research Methodology & Information Communication Technology

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**Unit 1: Basics of Research:**

Definition, objectives, motivation, types of research and approaches: descriptive research, conceptual, theoretical, applied and experimental.

**Unit 2: Formation of Research Problem:**

Research Process: To determine what type of research to be done, plan of research work, Selection of research area, prioritization of research. Literature review: importance and methods, sources, Objectives and scope of work, Developing Research Plan and Schedule: Scheduling Constraints, steps, problems in scheduling, limitations

**Unit 3: Mathematical Modelling and Simulation:**

a) Modelling: Concept of modelling, classification of mathematical models, modelling with ordinary differential equations, difference equations, partial differential equations, graphs,  
b) Simulation: concept, types (quantitative, experimental, computer, fuzzy theory, statistical) processes of formulation of model based on simulation. Variables and measurement

**Unit 4: Experimental Modelling:**

a) Definition of experimental design, examples, single factor experiments blocking and Nuisance factors, guidelines for designing experiments.  
b) General model of process: Input factors/ variables, Output parameters / variables controllable / uncontrollable variables, dependent / independent variables, experimental validity.  
c) Introduction to Risk assessment, reliability, sustainability, and uncertainty

**Unit 5: Analysis of data:**

Types of data: parametric and nonparametric, descriptive and inferential data, collection of data: normal distribution, calculation of co-relation coefficient  
Data processing: analysis, error analysis, meaning, different methods: analysis of variance, significance of variance, analysis of covariance, multiple regression, testing linearity / nonlinearity of model, testing adequacy of model. Introduction software used data

**Unit 6: Research Deliverables:**

Various Forms of Publication: Thesis, Paper, Research proposal  
Thesis Writing: Introduction, Literature Review or State-of-the-Art, Research Approach(methodology), Results or findings, Discussions, Conclusions, Scope for future work References, Appendices Presentation: Poster, thesis, proposal and paper

## **Unit 7: Components of ICT**

- a) Impact factor
- b) e-information
- c) Patents : Agencies, national /International , procedure for filing.
- d) e-submission
- e) International publications: notes, Letters/communications, full papers Review.
- f) h-index
- g) Citation index

### **• Reference Books**

1. C. R. Kothari, "Research Methodology", Willy Estern Ltd. ND.
2. Wayne Goddard and Stuart Melville, "Research Methodology-An Introduction", Juta & Co, Ltd, 2006
3. Lucienne T.M. Blessing, Amaresh Chakrabarti, "DRM, a Design Research Methodology," Springer-Verlag London Limited 2009
4. Yogesh Kumar Singh, "Fundamentals of Research Methodology and Statistics," NEW AGE INTERNATIONAL (P) LIMITED, PUBLISHERS
5. Douglas Montgomery, "Design of Experiments"
6. Willkinsion K.P. L., Bhandarkar, "Formulation of Hypothesis", Himalaya publishing, Mumbai.
7. Schank Fr, "Theories of Engineering Experiments", Tata McGraw Hill

Solapur University, Solapur  
Ph.D. Course Work - Revised  
Electronics Engineering  
(Faculty of Engineering & Technology)  
Paper II– Advances in Electronics Engineering



**1. Unit 1 – Network Services and Layered Architectures**

Applications, traffic Characterization and QOS, network services, high performance networks, network elements, network mechanisms, layered architecture, open data network model, network architectures, network bottleneck

**2. Unit 2- Internet & TCP/IP Networks**

Wireless internet, issues, mobile IP, TCP in wireless domain, WAP, Optimization

**3. Unit 3 – Ad Hoc Wireless Networks**

Introduction, issues, ad hoc wireless internet, applications

**4. Unit 4 – The Evaluation Generation and Third generation (3G) Overview**

Introduction, enhancements over 2G, GPRS overview , EDGE overview, AMR half rate traffic channels, GSM/GPRS/EDGE traffic channels, HSCSD, CDMA2000 (1XRTT) overview, WAP, SMS, migration path from 2G to 2.5G to 3G

**5. Unit 4- Third Generation (3G) Overview**

3G - Introduction, UMTS overview, CDMA 2000 overview, TD CDMA, TD SCDMA

**6. Unit 5- Multimedia on Wireless Networks**

Digitizing audio and video, streaming stored and live audio- video, real time interactive audio video, RTP,RTCP, voice over IP

• **References –**

1. High Performance Communication Networks, Jean Wallard, Pravin Varaiya, Morgan Kaufmann Publishers (Elsevier), Second Edition
2. 3G Wireless Networks, Clint Smith, P.E., Daniel Collins, McGraw Hill Communications, Tata McGraw – Hill Edition, Second Edition
3. Data Communications and Networking, Behrouz Forouzan, Tata McGraw Hill Education Private Limited, Fourth Edition
4. Ad hoc Wireless Networks : Architectures and Protocols, C. Siva Ram Murthy, B.S. Manoj, Pearson Education
5. IEEE Transaction on Communications
6. IEEE Journal on Selected Areas in Communications
7. IEEE Transaction on Wireless Communications

Solapur University, Solapur  
Ph.D. Course Work - Revised  
Electronics Engineering  
(Faculty of Engineering & Technology)  
Paper III– Elective – Advances in Image Processing



**1. Unit 1 – Image Segmentation**

Introduction, point, line and edge detection, thresholding, region based segmentation, use of motion in segmentation

**2. Unit 2- Image Representation and Description**

Image representation, boundary descriptors, regional descriptors, principal components for description, relational descriptors

**3. Unit 3 – Image Analysis**

Patterns and pattern classes, scene segmentation and labeling, counting objects, perimeter measurements, boundary following, projection, Hough transform, least squares and Eigenvector line fitting, shapes of regions, morphological operations, Fourier transforms, color,

**4. Unit 4 – Texture**

Statistical texture descriptors, syntactic texture descriptors, hybrid texture description methods, texture recognition method applications

**5. Unit 5- Modern Image Quality Assessment**

Subjective Vs objective image quality measures, problems with MSE, classification of objective image quality measures, HVS features, image quality assessment algorithms based on HVS

**6. Unit 6 – Applications of Image Processing**

Fingerprints, face recognition, iris recognition, watermarking, medical image processing, industrial machine vision, remote sensing

• **References –**

1. Digital Image Processing, Rafael C. Gonzalez, Richard E. Woods, Pearson Education, Third Edition
2. Digital Image Processing and Computer Vision, Milan Sonka, Vaclav Hlavac, Roger Boyle, Cengage Learning
3. Pattern Recognition and Image Analysis, Earl Gose, Richard Johnsonbaugh, Steve Jost
4. Digital Image Processing: An algorithmic Approach, Madhuri A. Joshi, Prentice Hall of India Pvt. Ltd
5. Modern Image Quality Assessment, Zhou Wang, Alan C. Bovik, Morgan & Claypool Publishers

Solapur University, Solapur  
Ph.D. Course Work - Revised  
Electronics Engineering  
(Faculty of Engineering & Technology)  
Paper III – Elective -Advanced CMOS VLSI Design



**1. Unit 1 – Fundamentals of MOS Structures & Transistor Theory**

Introduction to Band Theory, effective mass, Fermi level, energy diagrams, MOS structure, MOS capacitor, physical and electrical behavior with gate bias, (CV plots). NMOS transistor, Physical structure of MOS transistor, MOS transistor under static conditions, secondary effects, Models for MOS transistor, Process variation, Technology Scaling

**2. Unit 2 – Circuit Simulation**

The wire, Interconnect parameters (C, R, L), Electrical wire models

**3. Unit 3 – CMOS Inverter**

CMOS inverter, Static and Dynamic behavior of CMOS inverter, Power, Energy and Energy-Delay, Technology Scaling and Impact on inverter metrics

**4. Unit 4- Combinational & Sequential Logic Designs in CMOS**

Static CMOS design, Dynamic CMOS Design, Static latches and registers, Dynamic latches and registers, Pipelining

**5. Unit 5 – Timing issues in Digital Circuits**

Timing Classification of Digital Circuits, Synchronous Design (Clock Skew, Jitter, Clock Distribution, Latch Based Clocking), Self Timed Circuits Design (An Asynchronous Techniques), Synchronizers and Arbiters Using PLL for Clock Synchronization, DLL

**6. Unit 6 – Designing Building Blocks**

Adders, Multipliers, Shifters, Power and Speed Trade-Off in Datapath Structures, Introduction, Memory Core, Memory Peripheral Circuitry, Memory Reliability and Yield, Power Dissipation In Memories

**7. Unit 7– CMOS Manufacturing Process**

Basic CMOS technology, (n-well CMOS, p-well, CMOS, twin tub process), logic design rules, latch-up problem

• **References –**

- 1.“Digital Integrated Circuits”, Rabey, Chandrakasan, Nikolic, Pearson Education
2. “Principles of CMOS VLSI Design”, Neil Weste, Kamran Esharghian, Addison Wesley/ Pearson Education



Solapur University, Solapur  
Ph.D. Course Work - Revised  
Electronics Engineering  
(Faculty of Engineering & Technology)  
Paper III– Elective – Soft Computing Paradigms



**1. Unit 1 – Pulsed Neuron Models**

Spiking neuron model, integrate and finite model, conductance based models, computing with spiking neurons

**2. Unit 2- Applications of ANN**

Pattern classifications, optimization, vector quantization, control applications, speech applications- vowel classification, recognition of consonant vowel segments, image processing applications -printed character recognition, handwritten character recognition

**3. Unit 3 – Fuzzy Pattern Recognition**

Feature analysis, partitions, single sample identification, multifeature pattern recognition, image processing, syntactic recognition

**4. Unit 4 – Genetic Modeling**

Inheritance, cross over, inversion, deletion, mutation, bitwise operator, generation cycle, convergence of GA, applications, multilevel optimization, real life problems, advances

**5. Unit 5 – Hybrid Systems I**

Hybrid systems, neuro- fuzzy, neuro-genetic, fuzzy-genetic hybrids, GA based backpropagation, applications

**6. Unit 6- Hybrid Systems II**

Fuzzy backpropagation, fuzzy Artmap, Fuzzy associative memory

• **References –**

1. Neural Networks : A Classroom Approach, Satish Kumar, Tata McGraw Hill Publishing Company Ltd
2. Neural Networks, Fuzzy Logic and Genetic Algorithms , Synthesis & applications, S. Rajasekaran, G A Vijayalakshmi Pai, Prentice Hall of India Pvt. Ltd.
3. Neuro Fuzzy and Soft Computing: A Comprehensive Approach to Learning & Machine Intelligence, J S R Jang, C T Sun, E Mizutani, Prentice Hall of India Pvt. Ltd.
4. Artificial Neural Networks, B Yegynanarayan, Prentice Hall of India Pvt. Ltd.
5. Introduction to Artificial Neural Systems, Jacek M Zurada, Jaico Publishing House
6. Fuzzy Logic with Engineering Applications, Timothy J Ross, McGraw-Hill, Inc

# **Solapur University, Solapur**



**Ph.D. Course Work**

**Civil Engineering**

**(Faculty of Engineering & Technology)**

Solapur University, Solapur  
Civil Engineering  
(Faculty of Engineering & Technology)  
Syllabus for Ph.D. Course Work



<i>Sr. No</i>	<i>Subject</i>	<i>Examination Scheme Theory paper</i>
1	Research Methodology and Information Communication Technology (Common to all Branches of Engineering & Technology)	100 Marks
2	Advances in Civil Engineering	100 Marks
3	Elective – Advanced Developments in Civil Engineering	100 Marks

Elective –

- (1) Structural Engineering and Concrete Technology
- (2) Geotechnical Engineering and Construction Management
- (3) Environmental Engineering and Water Resources Engineering

*Note – Candidate shall select an elective in consultation with research guide.*

**Solapur University Solapur**

**Ph. D. Course work**

**Civil Engineering**

**(Faculty of Engineering and Technology)**



## **Paper-II: Advances in Civil Engineering**

**Maximum Marks: 100**

**Paper Duration: 3 Hours**

### **Unit 1:**

#### **Numerical methods for Engineering Computations**

Fundamentals of numerical methods, Error analysis, Differentiation, integration, interpolation and extrapolation, Solution of non-linear algebraic and transcendental equation.

Solution of systems of linear and non-linear algebraic equations, Eigen value problems. Solution of partial differential equation, initial and boundary value problems. Computer oriented algorithms, Numerical solution of problems related to shallow and deep foundation, Flow through porous media, Settlement computations under different loading conditions and consolidation.

### **Unit 2:**

#### **Statistics and Probability**

Various distribution binomial, normal, log-normal, Poisson, Beta B, gamma distribution, Pearson type I,II & II distribution test of significance, Chi square test, correlation, simple and multiple regression, Markov Chain, Markov process.

Correlation and Regression and Multivariate Analysis: Bivariate Frequency Distribution Scatter Diagram, Correlation Analysis, Multiple Regression Analysis-Non linear Regression. Use of regression analysis in resources management.

#### **Reference Books:**

1. Montgomery, Douglas C. (2007), 5/e, Design and Analysis of Experiments, (Wiley India)
2. Montgomery, Douglas C. & Runger, George C. (2007), 3/e, Applied Statistics & Probability for Engineers (Wiley India)

3. Numerical methods for Scientific and Engineering Computation by M.K. Jain, S.R.K Iyengar & R.K. Jain and published by Wiley Eastern Ltd.
4. Numerical methods for Engineering Computation by D.V. Griffiths and I. M. Smith, Published by Blackwell Scientific Publication.
5. Numerical methods in FORTRAN by John M. Mc & M. G. Salvadori, Published by Prentice Hall of India
6. Numerical analysis in Geotechnical Engg. By C. S. Desai

### **Unit 3:**

#### **Remote Sensing and GIS in Planning and Disaster management**

Aerial photography, Application of aerial photography in town planning studies, Satellite remote sensing. Application of remote sensing in regional studies, G.I.S applications in planning and its role in remote sensing, Disaster, Prevention, Preparedness (Warning), Relief.

#### **Environmental Management and Impact Assessment**

Environmental management, problems and strategies; Future strategies; Multidisciplinary Environmental strategies, Environmental Impact Assessment (EIA), Sustainable Development (SD), Initial Environmental Examination (IEE), Environmental Impact Statement (EIS), environmental appraisal, Environmental Audit (EA); Environmental impact factors and areas of consideration, measurement of environmental impact.

#### **Reference Books:**

1. Michael Hord, R. Remote sensing methods and application, John Wiley and Sons, New York, 1986.
2. Harvey M. Rubenstein , A Guide to site and Environmental planning, New York

### **Unit 4:**

#### **Optimization Techniques**

Optimization techniques, various models, objectives functions and constraints, convex and concave functions, regions and sets. Linear programming, two phase method, method of Big M, dual. Sensitivity analysis. Allocation problems, Transportation problem, Assignment problem.

#### **Reference Books:**

1. Jorge Nocedal and Stephen Wright; Numerical Optimization, Springer, 2<sup>nd</sup> edition, (2006)
2. S. S. Rao; Engineering Optimization: Theory and Practice, Wiley, 4th edition, (2009)

## OR (*for unit 4 only*)

### **Unit 4:**

#### **Infrastructure Development**

Role of infrastructure development in employment generation and improvement of the National economy. Various agencies associated with infrastructure development in India as regards various sectors. Indian government policy, Roads and buildings, communication, water supply, irrigation, power energy sectors, ports and aviation, health and educational services, rural development. Pre-requisites necessary to ensure success for switching over from public sector management to private sector management, issues in developing, funding and managing infrastructure projects, role, responsibility of project management consultants.

#### **Reference Books:**

1. India Infrastructure Report – Rakesh Mohan
2. Infrastructure Today - Magazine
3. Document of five year plans, published by Govt. of India.

### **Unit 5:**

#### **Deep Foundations**

Axial capacity of groups of piles, Settlement of single piles and groups. Uplift capacity (including under-reamed piles). Negative skin friction. Pile load tests. Pile integrity tests. Codal provisions. Caissons-types, construction techniques, difficulties in construction. Design of well foundation. Foundations in difficult soils: expansive soils, chemically aggressive environment, soft soils, fill, regions of subsidence.

#### **Reference Books:**

1. Engineering with Geosynthetics: ed. G. Venkatappa Rao, GVS Suryanarayana Raju, Tata McGraw Hill Publishing Co. Ltd.
2. ASTM and Indian Standards on Geotextiles.
3. Koerner, R. M.: Designing with Geosynthetics, Prentice Hall, NJ.
4. Jones, C.J.E.P. Reinforcement and soil structures, Butter worth Publications.

## **Unit 6:**

### **Advanced Concrete Technology:**

Light weight concrete, ultra light weight concrete, vacuum concrete, mass concrete, waste material based concrete, shotcreting, guniting, sulphur concrete and sulphur infiltrated concrete, jet cement concrete (ultra rapid hardening), gap graded concrete, no fines concrete, high strength concrete, high performance concrete and under water concreting.

### **Reference Books:**

1. Concrete technology by Santhakumar- Oxford University Press.
2. Concrete technology-A. M. Neville and Brooks
3. Properties of Concrete- Murdock.
4. Properties of Concrete-P. K. Mehta.
5. Concrete Technology- M. S. Shetty.
6. Fiber Reinforced Cement Composite- P. N. Balguru & P. N. Shah.



# Solapur University Solapur

Ph. D. Course work

Civil Engineering

(Faculty of Engineering and Technology)

Paper-III: Elective: Structural Engineering & Concrete Technology

Maximum Marks: 100

Paper Duration: 3 Hours

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## STRUCTURAL ENGINEERING

### Unit 1:

#### Stiffness Method

Concept of stiffness. Linearly elastic structures. Derivation of stiffness equation, stiffness coefficients. Development of stiffness matrix. Analysis of beam, portals, trusses ( $DKI \leq 3$ ). Sinking of support.

### Unit 2:

#### Member Oriented Stiffness Method

Stiffness matrices of beam, truss, plane frame. Transformation of matrices on structure axis. Overall joint stiffness matrix and nodal load vector, assembly rules. Calculation of member end forces.

### Unit 3:

#### Finite Element Method

Fundamentals of finite element. Stress strain relations, strain displacement relations, plane stress and plane strain problems. Compatibility conditions. 1 D element- 2 noded, 3 noded etc. Application of FEM for the analysis of plane truss, continuous beam and simple plane frame problems

### Unit 4:

#### Finite Element Method 2D Elements:

Use of displacement functions. Pascal's triangle. Types of 2 D elements- triangular, rectangular, quadrilateral. Formulation of element stiffness matrix



## Reference Books:

1. **W. Weaver , J.M. Gere** - “*Matrix Analysis of framed structures*”- CBS publishers and Disributers,1986
2. **H. C. Martin** –“ *Introduction to Matrix Methods of Structural analysis*” - International text book Company, 1996
3. **G.S. Pandit & S. P. Gupta** – “*Structural Analysis, A Matrix Approach*”- Tata Mc Graw-Hill, 1981
4. **C.S. Reddy** – “ *Basic structural Analysis*”- Tata Mc Graw-Hill, 1996
5. **L. S. Negi and R. S. Jangid**- “*Structural Analysis*”- Tata Mc Graw-Hill, 1997
6. **S. Rajasekaran**- “*Computational Structural Mechanics*”, PHI, New Dehi 2001.
7. **Cook R. D., Malkan D. S. & Plesta M.** - “*Concepts and Application of Finite Element Analysis*” - 3<sup>rd</sup> Edition, John Wiley and Sons Inc., 1989
8. **Zienkeiwicz. O.C**- “*The Finite Element Method*” - Tata McGraw Hill Co. Ltd., New Delhi.
9. **Krishnamoorthy C S** -, “*Finite Element Analysis*”- Tata McGraw Hill
10. **Chadrupatla, Tirupathi R.**- “*Finite Element Analysis for Engineering and Technology*”- University Press, India
11. **J.F. Abel and Desai. C.S.** – “*Introduction to the Finite Element Method*” - Affiliated East West Press Pvt. Ltd., New Delhi.
12. **S.S. Bhavikatti** -“*Finite Element Analysis*” - New Age International Publishers, New Delhi.

## ADVANCED CONCRETE TECHNOLOGY

### Unit 5:

Design of high strength concrete mixes, design of light weight aggregate concrete mixes, design of fly ash cement concrete mixes, design of high density concrete mixes Advanced non-destructive testing methods: ground penetration radar, probe penetration, pull out test, break off maturity method, stress wave propagation method, electrical/ magnetic methods, nuclear methods and infrared thermography, core test.

**Unit 6:**

Historical development of fibre reinforced concrete, properties of metallic fiber, polymeric fibres, carbon fibres, glass fibres and naturally occurring fibers. Interaction between fibres and matrix (uncracked and cracked matrix), basic concepts and mechanical properties: tension and bending.

**Reference Books:**

1. Concrete technology by Santhakumar- Oxford University Press.
2. Concrete technology-A.M.Neville and Brooks
3. Properties of Concrete- Murdock.
4. Properties of Concrete-P.K.Mehta.
5. Concrete Technology- M.S.Shetty.
6. Fiber Reinforced Cement Composite- P.N.Balguru & P.N.Shah.



**Solapur University Solapur**

**Ph. D. Course work**

**Civil Engineering**

**(Faculty of Engineering and Technology)**

**Paper-III: Elective: Geotechnical Engineering and Construction Management**

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## **GEOTECHNICAL ENGINEERING**

### **Unit 1:**

#### **Advanced Geotechnical Engineering**

Stress distribution under earth embankments and evaluation of settlement profile. Field problems to monitor movement of slopes, foundations, etc.

#### **Advanced Foundation Engineering**

Foundations in difficult soils: expansive soils, chemically aggressive environment, soft soils, fill, regions of subsidence.

#### **Geotextiles**

Definitions, functions, properties, and application of Geotextiles, design of Geotextile applications, definitions, functions, properties and applications of geomembranes, design of geomembranes applications, Geotextiles associated with geomembranes, testing on geotextiles, environmental efforts, ageing and weathering.

### **Unit 2:**

#### **Rock mechanics and Tunneling**

Deformation characteristics of rocks and its measurement. Instrumentation, Underground excavation and subsidence. Bearing capacity of homogeneous as well as discontinuous rocks. Soil Dynamics and Geotechnical Earthquake Engineering. Soil behaviour under dynamic loads. Seismic response, strong ground motion, its parameters and their estimation, seismic hazard analysis, local site effects and design ground motion, seismic slope stability.

### **Unit 3:**

#### **Geo-environmental Engineering**

Landfills, in ash ponds and tailing ponds, and in rocks. Detection, control and remediation of subsurface contamination; Engineering properties and geotechnical reuse of waste.

#### **Soil Structure Interaction**

Elastic and plastic analysis of stress distribution on yielding bases. Analysis of conduits. Interaction analysis of piles and pile groups. Elastic continuum and elastoplastic analysis of piles, Non-linear load-deflection response.

#### **Reference Books:**

1. Bowles J E (1996), Foundation Analysis and Design, McGraw Hill.
2. Das B M (1997), Advanced Soil Mechanics, Taylor and Francis.
3. Das B M (1993), Principles of Soil Dynamics, Brooks/Cole
4. Coduto D P (2001), Foundation Design: Principles and Practices, Prentice -Hall
5. Kaniraj S R (1988), Design Aids in Soil Mechanics and Foundation Engineering, Tata McGraw Hill
6. Poulos H G and Davis E H (1980), Pile Foundation Analysis and Design, John Wiley and Sons
7. Karl Terzaghi (1954), Theoretical Soil Mechanics, Chapman and Hall
8. Rock Mechanics in Engineering Practice: Stag and Zienkiewez, John Willey & Sons
9. J.C. Jagger and N.G.W. Cook(1971), Fundamentals of Rock Mechanics, Methuen and Co., London.
10. Sarsby R (2000), Environmental Geotechnics, Thomas Telford
11. Hsai-Yang Fang, Introduction to Environmental Geotechnology, CRC Press.
12. Kramer S L (1996), Geotechnical Earthquake Engineering, Prentice Hall
13. Wolf J P (1985), Dynamic Soil-Structure Interaction, Prentice-Hall

14. G. Venkatappa Rao, GVS Suryanarayana Raju, Engineering with Geosynthetics: Tata McGraw Hill Publishing Co. Ltd.
15. ASTM and Indian Standards on Geotextiles.
16. Koerner, R. M.: Designing with Geosynthetics, Prentice Hall, NJ.
17. Jones, C.J.E.P. Reinforcement and soil structures, Butter worth Publications.

## **CONSTRUCTION MANAGEMENT**

### **Unit 4:**

#### **Project Management**

CPM, PERT networks, Cost/ Resource based networks, scheduling, monitoring and updating, resource planning and allocation, LOB, network crashing, time cost trade off. Computer Application in Construction Management- Software for network analysis, CPM, PERT, GERT, decision tree analysis.

#### **Financial Aspects of Construction Projects**

Means of Finance, Working Capital Requirements, Project Cash Flow Projections and Statements, Project Balance Sheet, Profit Loss Account Statements, Concept of Debt Equity Ratio, Tax – Need and types

### **Unit 5:**

#### **Risk Management**

Introduction, Principles, types, origin, risk control, Use of mathematical models: Sensitivity Analysis, Break Even Analysis, Simulation Analysis, Decision Tree Analysis, Risk identification, analysis and mitigation of project risks, Role of Insurance in Risk Management.

### **Unit 6:**

#### **Material Management:**

Material planning, accounting and material reconciliation. Systems of material classification. Deterministic and probabilistic models and applications, ABC analysis, replenishment and replacement policies, VED analysis, lead time demand, purchase planning, EOQ model. Wastage audit at site, Site waste material management plan. Computer applications based upon available software.

**Reference Books:**

1. Construction Engineering and Management by. S. Seetharaman, Umesh Publications, New Delhi
2. Total Project Management- the Indian Context by P. K. Joy Macmillan India Ltd. Financial Management by Prasanna Chandra, Tata Mc Graw Hill Publicaitons
3. Construction Project Management-Planning, Scheduling and Controlling by K. K. Chitkara, Tata McGraw Hill Publishing Company, New Delhi
4. Materials Management – Gopalkrishnan and Sunderasan, Prentice Hall Publications
5. Construction Planning, Methods & Equipment: Puerifoy – Tata McGraw Hill
6. Operations Research- Hamdy A. Taha
7. Engineering Optimisation- S. S. Rao



# Solapur University Solapur

## Ph. D. Course work

### Civil Engineering

#### (Faculty of Engineering and Technology)

#### Paper-III: Elective: Environmental Engineering and Water Resources Engineering

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##### Unit 1:

##### Water Treatment

Water Quality: Requirement, Standards, Stream & Effluent standards. Water purification, physical, chemical and biological processes. Unit operations, unit processes. Aeration, Sedimentation, Coagulation & flocculation, Filtration: Adsorption, adsorption, Ion Exchange membrane Processes, RO, Ultrafiltration, Electrolysis and Disinfection.

Waste waters Sources and characteristics, BOD progression & its formulations, Fundamentals of Design of W/W treatment systems- Primary, secondary and tertiary; ASP, Nitrification-denitrification, Ponds and aerated Lagoons, Attached Growth Biological Treatment Systems: TF, RBC, Activated Bio-filters, USAB, Expanded granular bed reactors,. Sludge Digestion: anaerobic and aerobic, Waste water reclamation and reuse, Effluent disposal.

##### Unit 2:

##### Air Quality Monitoring and Control Techniques

Air pollutants: Sources, classification, Combustion Processes, pollutant emission, Effects on Health, vegetation, materials, atmosphere, Reactions of pollutants Scales of AP studies, effects as per scales, Air sampling, pollution measurement methods, Ambient air quality and emission standards, Air Act, legislation and regulations, Removal of gaseous pollutants. Particulate emission control; bioscrubers, biofilters, Indoor air quality Models for Water and Air Quality Introduction to Mathematical Models: Modelling approaches to water quality - classification and considerations in selecting models, DO model for streams, Streeter - Phelps model -oxygen 'sag' curve, Benthic oxygen demand Air quality models : Gaussian dispersion model, Regional air quality models.

### **Unit 3:**

#### **Environmental Management and Impact Assessment**

Environmental management, problems and strategies; Future strategies; multidisciplinary Environmental strategies, Environmental impact assessment (EIA), Sustainable development (SD), initial environmental examination (IEE), environmental impact statement (EIS), environmental appraisal, environmental audit (EA); Environmental impact factors and areas of consideration, measurement of environmental impact, SWM: Waste Management -Sources, Classifications, Characteristics, Generations, Onsite Handling and Storage, Collection, Transfer Recycling and Disposal Techniques of Municipal Solid Waste (MSW), Hospital Waste Management.

#### **Reference Books:**

1. Manual on water supply and Treatment ", CPHEEO, Ministry of Urban Development, GOI, New Delhi, 1999.
2. Manual on Sewerage and Sewage Development ", CPHEEO, Ministry of Urban Development, GOI, New Delhi, 1993.
3. B.A. Hauser, " Practical Hydraulics Hand Book ", Lewis Publishers, New York, 1991.
4. M.J. Hammer, " Water and Wastewater Technology ", Regents/Prentice Hall, New Jersey, 1991.
5. Wastewater Treatment and Reuse: Metcalf and Eddy.
6. Air Pollution: Stern
7. Wastewater Treatment for Pollution Control; Arceivala and DR. Asolekar
8. Industrial Wastewater Treatment: Nelson – Numero
9. Industrial Wastewater Treatment: Dr. A. D. Patwardhan
12. Zipparro, V.J., Davis' Handbook of Applied Hydraulics Fourth Edition. McGraw Hill, 1993. ISBN: 0070730024
- 15 Eckenfelder, W.W. (Jr.), Industrial Water Pollution Control, (2nd Ed). McGraw-Hill, 1989. ISBN: 007018903X.
- 19 American Water Works Association, Water Quality and Treatment: A Handbook of Community Water Supplies. McGraw Hill, 1998. ISBN: 0070015406



20 Kawamura, S., Integrated Design and Operation of Water Treatment Facilities.  
Wiley and Sons, 2000. ISBN: 0471350931

## **Unit 5:**

### **Water Resources Engineering**

Water resources systems analysis, design and management for water supply, irrigation, drainage, hydropower, flood control, droughts. Surface and ground water hydrology, stochastic hydrology, physical and numerical modeling, use of finite difference, finite element and boundary element methods.

#### **Reference Books:**

1. Principles of water resources planning and management – Goodman
2. Applied hydrology – Linsley Kolhar and Paulhas (McGraw Hill)

## **Unit 6:**

### **Introduction to Weather and Climate**

Atmosphere and its constituents, Synoptic observations- surface and upper air. Tropical meteorology: Easterly Waves, ET-ITCZ, Inversion. Monsoon - Onset, Activity, Withdrawal, Breaks, Depressions, Easterly Jet Stream. Post Monsoon - Cyclones in the Indian Seas, N. E. Monsoon.

Global Climatology - Global distribution of pressure and temperature at m.s.l. in winter and summer, distribution of annual rainfall and its variability, distribution of moisture and clouds. Vertical distribution of temperature. General circulation of atmosphere. Development of monsoons. Major categories of world climates.

Indian Climatology - Different seasons. Distribution of Means Sea level pressure/temperature in different seasons. Wind circulation and temperature distribution over India in lower, middle and upper troposphere in different seasons. Indian rainfall in different seasons. Indian summer monsoon, onset, withdrawal, rainfall distribution, inter annual variability of monsoon. Main synoptic pressure systems causing weather over India in different seasons.

**Reference Books:**

1. Atmosphere, Weather and Climate R.J. Barry and R.G. Chorley (Methuen Publication)
2. General Climatology” Critchfield
3. South West Monsoon” by Y.P. Rao (IMD Publication) .
4. An Introduction to Meteorology by S. Pettersen
5. Elements of meteorology by Miller, Thompson and Paterson
6. General Meteorology by H.R. Byer
7. Monsoon by P.K. Das
8. Tropical Meteorology by T.N. Krishnamurthy
9. Tropical Meteorology by Riel.
10. Tropical Meteorology Vol 1, 2, 3, by G.C. Asnani

# **Solapur University, Solapur**

## **M.Phil/Ph.D Course Work Syllabus**

### **Pharmacy**

**(w.e.f.2014-15)**

1. Research Methodology & Information Communication Technology
2. Pharmaceutical Sciences-I
3. Pharmaceutical Sciences-II

## 2. Pharmaceutical Sciences-I

**Drug Discovery and Development:** Pre-discovery, Drug Discovery, Early Safety Tests, Preclinical Testing, General principles of screening, correlations between various animal models and human situations, animal ethics.

**Clinical Trials:** Types, design, protocol, Phases viz., Phase 0, Phase I, Phase II, Phase III, Phase IV, Phase V, safety, ethical conduct.

**Analytical methods:** Analytical Methods for the Drugs in pharmaceutical dosage forms and biological fluids, methods and procedures for assuring that quality is designed into pharmaceutical products. Basic principles and pharmaceutical applications of UV-Visible Spectroscopy, IR Spectroscopy, HPLC Chromatography, ELISA.

**Drug Regulatory bodies:** Drug Regulatory Agencies of developed countries, Investigational New Drug (IND) Application, New Drug Application (NDA) & Abbreviated New Drug Application (ANDA) Approval.

**GMP:** Guidelines- Building and Facilities, Equipment, Personnel, Raw Materials, Production, Laboratory Controls, Records, Labeling and ICH guidelines.

### 3. Pharmaceutical Sciences-II

**Biopharmaceutics:** Introduction, biopharmaceutic principles. Basic Pharmacokinetics- Introduction, compartmental models and Non compartment model.

**Bioavailability & Bioequivalence:** Definitions, bioavailability and bioequivalence, relative and absolute bioavailability, bioequivalence studies for solid oral drug products.

**Novel Drug Delivery Systems:** Transdermal Delivery Systems; Carrier Based Delivery Systems-Liposomes, Monoclonal Antibodies, Nanoparticles, Microspheres; Variable Release Delivery Systems-Osmotic Pump, Microencapsulation, Ion Exchange Resins, Tablets in Capsules; Implantable Delivery System; Nasal Delivery Systems

**Drug Interaction:** Introduction, pharmacokinetic interactions, pharmacodynamic interactions, clinical significance and management of drug interactions. **Adverse Drug Reaction Reporting:** Introduction, definition, types, recognition, surveillance program reporting to FDA.

**Scope of Pharmacy & Role of Pharmacist:** National drug policy of India, guidelines for rational prescribing, rational use of antibiotics common OTC drugs, Role of Pharmacist, Drug Information Resources and essential drugs.

**SOLAPUR UNIVERSITY, SOLAPUR**  
**Course Work for Ph.D. – Mechanical Engineering**  
**(w.e.f. June-2014-15)**

Paper No.	Name of the Subject	Type	Examination Scheme			Duration of Paper
			T/W	Theory	Oral	
I	Research Methodology & Information Communication Technology	Compulsory	--	100	--	3 hrs
II	Modern Topics in Mechanical Engineering from Performance Improvement Perspective	Compulsory	-	100	--	3 hrs
III	Elective -I	*	--	100	--	3 hrs

**\*Any one subject as Elective is to be studied and examined  
As recommended by Guide**

Sr. No.	Elective Subject
1	Advanced Developments in Industrial & Production Engineering
2	Advanced Developments in Mechanical Design Engineering
3	Advanced Developments in Thermal Engineering

## Ph.D. Mechanical Engineering Paper-II

### Modern Topics in Mechanical Engineering from Performance Improvement Perspective

Teaching Scheme  
Lecturers: 3 Hrs/ Week

Examination Scheme  
Theory: 100 Marks

Name of the topic	Contents	Hours	Remarks
<b>1. Creating quality by design</b>	Product development cycle, Assessment of customer's needs, Formulation of design specifications, Preliminary design, General consideration for a good design, functional efficiency, safety, reliability, maintainability, ease of production, standardization, review of design, evaluation of prototype, preparation of manufacturing drawings, formulation of product specifications, design changes during production, Economics of quality.	8	
<b>2. Quantity Function Deployment (QFD)</b>	Introduction , Kano model of QUALITY , History of QFD, Components of QFD model Steps of QFD.  Advantages , limitations of QFD , Successful cases of QFD  QFD and other tools , QFD in Service industries	6	
<b>3. Design Optimization</b>	Need , Application , classification , Formulation  Statement formulation , stakeholders of process  Design parameters , Robust Design , Portfolio design  Optimization programming , optimization design of mechanical system	6	
<b>4. Quality Control of manufacturing process</b>	Quality planning for manufacturing, process capability, process control & its techniques, Statistical Process control techniques, Manufacturing Quality Control, Control of Product during inspection & disposal of rejected products.	10	

<b>5. ISO 9000</b>	ISO 9000 series of standards , Need , Principles of QMS , process approach , Requirements of ISO 9001 : 2008 , Implementation , Evaluation of QMS , Continual improvement in ISO 9001	<b>6</b>	
<b>6. Six Sigma</b>	<p>Changing business scenario , History of Six Sigma , Success stories ,Management , Improvement strategies , Difference between TQM and Six Sigma</p> <p>Key process input variables , Key process Output variables , concept of variation , Sigma conversion table , standard deviation DMAIC model of Six Sigma , Six Sigma roadmap , Six Sigma Infrastructure (Champion, black belt etc. )</p> <p>Measuring current performance , Data collection , Sampling plans , baseline defects ,measures , identification of improvement opportunities , Calculation of defects per million opportunity (DPMO)</p> <p>Six Sigma analysis and improvement , Six Sigma tools , Root cause analysis , cause and effect diagram , Pareto chart , time series plot , run chart</p> <p>Failure mode and effect analysis (FMEA) Do's and Don'ts of Six Sigma , Project selection Introduction to Design Of Experiments (DOE)</p>	<b>14</b>	
<b>Total Hours</b>		<b>50</b>	

**References:**

1. Quality Handbook– Juran J.M. McGraw hill Publication.
2. Grant S.P. - Statistical Quality Control- Tata McGraw hill Publication.
3. Organizational excellence through Total Quality Management- H. Lal, New Age Intl. Publishers, New Delhi.
4. Francis T. Farago, Mark A. Curtis- Handbook of dimensional measurement.
5. Harrison M., Wordsworth, Stefeen Godfrey-- Modern Methods for Quality Control and Improvement, Wiely Publication.
6. Quality Control Kulkarni— V. A. and Bewoor A. K. John Wiley Publication, New Delhi.



**Ph.D. Mechanical Engineering Paper-III**  
**Advanced Developments in Industrial & Production Engineering**  
**(Elective-I)**

**Teaching Scheme**  
**Lecturers: 3 Hrs/ Week**

**Examination Scheme**  
**Theory: 100 Marks**

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**Operations Strategy** - Competitive priorities, strategic decisions in operations, strategy deployment (2)

**Forecasting** - Casual and Time series models, Simple and weighted moving average, Exponential smoothing, Trend and Seasonality. (4)

**Layout** - Designing process layouts, product layouts, service layouts, Line balancing. (6)

**Aggregate Planning and Capacity Planning** - Process of aggregation, Pure and mixed strategies, Chase demand and levelling strategies, Techniques for aggregate planning, Defining and measuring capacity, Tools for capacity planning. (6)

**Inventory Management and Resource Planning** - Inventory Costs, Functions, Inventory control systems, How much to order – EOQ, EPQ, Quantity discounts, Overview of Material Requirement Planning (MRP), Master production schedule (MPS), Inputs to MRP, The MRP process, Lot sizing in MRP systems, MRP outputs, Introduction to Enterprise Resource Planning (ERP). (6)

**Supply Chain Management** - Management of supply chains, Distribution, Information Technology – a supply chain enabler, measuring supply chain performances. (4)

**Lean Production** - Just in Time (JIT) and lean production, The basic elements of lean production – Flexible resources, Cellular layouts, Pull system, KANBANs, Small lots, Quick setups, Uniform production levels, Quality at Source (6)

**Scheduling** - Loading – Load profile, Gantt chart, Assignment method; Sequencing – Priority sequencing rules, Johnson's rule, other criteria; Scheduling – Gantt chart scheduling, Forward and backward scheduling, Theory of constraints. (6)

**References :**

Operations Management – Krajewski and Ritzman

Operations Management – Russell and Taylor

Production planning and Inventory Control – Narsimhan, Maleavey, and Billington.

Operations Management – Stevenson

Production and operation management – Adam and Ebert

Production and operation management – Martinich

## **Ph.D. Mechanical Engineering Paper-III**

### **Advanced Developments in Thermal Engineering (Elective-II)**

**Teaching Scheme**  
**Lecturers: 3 Hrs/ Week**

**Examination Scheme**  
**Theory: 100 Marks**

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**Unit 1: Thermodynamics:** Laws of thermodynamics, Entropy, Irreversibility and Availability, Behaviour of ideal and real gases, Calculation of work and heat in ideal processes. Analysis of thermodynamics cycles related to energy conversion.

**Unit 2: Heat Transfer:** Modes of heat transfer, Resistance concept, Unsteady heat conduction, Fins, Effect of turbulence, Radiative heat transfer, black and grey surfaces shape factors, network analysis, Heat exchangers.

**Unit 3: Mass Transfer:**

Mass transfer - 1, Droplet vaporization -1, Mass transfer-2, Droplet vaporization – 2, Mass transfer- 3 (Any two)

**Unit 4: Combustion:**

Premixed and Diffusion flames

**Unit 5: Computational Fluid Dynamics –**

Finite volume algorithm, up-winding, Solution of pressure field on Cartesian meshes  
 Mesh generation technique

**Unit 6: Turbulence**

Governing equations, Free shear flows, Near wall behavior, Energy spectrum, Turbulence Models Solution on Non-Cartesian meshes.

**Unit 7: Advanced Topics in Refrigeration and Cryogenics**

Refrigeration applications in preservation of Food, transport by trucks and containers;  
 Railway cars; Marine

Refrigeration; Fans and Blowers, Sound Control. Construction of psychrometric charts, enthalpy deviation curves (Any two)

**Unit 8: Energy Conversion System:** Basic cycles related to energy conversion systems, Combined cycle, Cogeneration system, Steam generator, Steam turbine, Gas turbines, Nuclear power plant, Hydroelectric plant.

#### **Reference Books :**

1. ASHRAE HANDBOOKS (i) Fundamentals (ii) Refrigeration
2. Threlkeld J.L., “Thermal Environmental Engineering”, Prentice Hall
3. Dossat R.J., Principles of Refrigeration, Pearson Education Asia

**Reference Books:**

1. W.M Kays and M.E. Crawford, "Convective Heat and Mass Transfer", McGraw Hill Intl.
2. T Cebeci, "Convective Heat Transfer", Springer
1. W.M Kays and M.E. Crawford, "Convective Heat and Mass Transfer", McGraw Hill Intl.
2. D. Brian Spalding, "Combustion and mass Transfer", 1<sup>st</sup> edition, Pergamon Press, 1979
1. Kenneth K.Kuo, "Principles of Combustion", John Wiley and sons. Inc, 2005
2. Irvin Glassman, "Combustion", Academic Press, 1987
3. Turns,S.R., "An Introduction to Combustion, Concepts and Applications", Mc-Graw Hill, 2000
4. Williams,F.A., "Combustion Theory" The Benjamin and Cummings Publishing Company Inc.,1985
5. Law,C.K., "Combustion Physics", Cambridge University Press,2006
1. Wesseling P, "Principles of Computational fluid dynamics", Springer
2. Ferziger J.H., "Computational methods for fluid dynamics", Springer 27
3. Anderson, J.D. "Computational Fluid Dynamics: The Basics with Applications", McGraw Hill, 1995
4. Ferziger,J.H. and Peric,M., "Computational Methods for Fluid Dynamics", Springer, 1999
5. Patankar,S.V., "Numerical Heat Transfer and Fluid Flow", Narosa Publishing House, USA, 1980
6. Date,A.W., "Introduction to Computational Fluid Dynamics", Cambridge University Press, 2005
7. Wilcox,D.C., "Turbulence Modelling for CFD", DCW Industries Inc.,1994
8. Chung,T.J., "Computational Fluid Dynamics", Cambridge University Press, 2002
9. Thompson,J.F., Warsi,Z.U.A. and C.W. Mastin, "Numerical Grid Generation-Foundations and Applications" North Holland, 1985
1. Stephen B. Pope, "Turbulent flows", Cambridge Univ. Press
2. Hinze J.O., "Turbulence", McGraw Hill

# **Ph.D. Mechanical Engineering Paper-III**

## **Advanced Developments in Design Engineering (Elective-III)**

**Teaching Scheme**

**Lecturers: 3 Hrs/ Week**

**Examination Scheme**

**Theory: 100 Marks**

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**Unit 1: Mechanical Engineering Design:** Load analysis; modes of failure; theories of failure; safety factors; reliability; selection of materials; design of machine elements subjected to static & fatigue loading; shafts; gears; bearings, etc.; design against creep & fracture; Tribological system design.

**Unit 2: Advanced Theory of Elasticity (3-dimensional problems):**

Theories of Stress and strain, Transformation of stress and strain, Linear stress-strain –temperature relations, Applications of energy methods, Torsion, Bending, Plates

**Unit 3: Vibrations**

Multi-degree freedom systems, Approximate and numerical methods, Continuous systems, Nonlinear systems

**Unit 4: Fracture Mechanics**

Linear Elastic Fracture Mechanics, Elastic Plastic Fracture Mechanics, Fracture Mechanisms in Metals

**Unit 5: Finite Element Methods**

Thermal analysis (temperature effects), 2D, 3D elements, Contact analysis, Non-linear static analysis

**Unit 6: Reliability Engineering:**

Reliability evaluation of complex systems, Safeties and certifications, Terro technological Aspects

**Unit 7: Theoretical & Experimental Stress Analysis:** Analysis of three-dimensional state of stress and strain; experimental stress analysis tools like photo-elasticity; strain rosettes; brittle coating; oiré fringes.

### **Reference Books**

1. Boresi A.D., Schmidt R.J, and Sidebottom O.M, “Advanced Mechanics of Materials”, Wiley
2. Richard Budynas, “Advanced strength of applied stress analysis”, McGraw Hill
3. Cook R.D., Young W.C., “Advanced Mechanics of Materials”, Prentice Hall
4. Timoshenko and Goodier, “Theory of Elasticity”, McGraw-Hill Publications
5. M/c standard 8005

6. Kapur K.C., and Lamberson L.R., “Reliability in Engineering Design”, Wiley India Pvt. Ltd., 2009.
7. Bathe K J “Finite Element Procedures”, Cambridge, MA 2007
8. Sequerlind L J, “Finite Element Analysis”, Wiley, 2<sup>nd</sup> edition, 1984
9. Reddy J.N., “An Introduction to Finite Element Method”, McGraw Hill  
Balakumar Balachandran and Edward Magrab, “Vibrations”, Thomson Brooks/Cole, 2004.
10. Kelly S.G., “Mechanical vibrations”, McGraw-Hill, 2007. T L Anderson, Fracture Mechanics-  
Fundamentals and Applications, CRC Publishers, 2<sup>nd</sup> edition, 1995
11. Ashok Saxena, Nonlinear Fracture Mechanics for Engineers, CRC Publications
12. Hertzberg R.W., Deformation and Fracture Mechanics of Engineering Materials, Wiley, 4<sup>th</sup>  
edition, 1996.
13. Handbook of air-conditioning system design, Carrier Incorporation, McGraw Hill Book Co.,  
U.S.A.
14. Hainer R.W. ‘Control Systems for Heating, Ventilation and Air – Conditioning’, Van Nostrand  
Reinhold Co., New York, 1984.
15. Ugural and Fenster, “Advanced Strength and Applied Elasticity”, 4<sup>th</sup> Ed., Prentice Hall, PTR,  
2003.
16. Srinath L.S, “Advanced Mechanics of Solids”, Tata Mc-Graw Hill, New Delhi, 2003.

# Solapur University, Solapur



Ph.D. Course Work

Electronics and Telecommunication  
Engineering

(Faculty of Engineering & Technology)

**Solapur University, Solapur**  
**Ph.D. Course Work**  
**Electronics and Telecommunication Engineering**  
**(Faculty of Engineering & Technology)**  
 Syllabus for Ph.D. Course Work



Sr No	Name of Subject	Marks
1	Research Methodology	100
2	Advances in Electronics and Telecommunication Engineering	100
3	Elective	100

Elective –

1. Advanced Development in wireless Communication & Coding Technique
2. Advanced Development in Signal Processing
3. Advanced Development in Image Processing

Note – Candidate will select an elective in consultation with guide from any one of the following.

- Electronics & Telecommunication Engineering
- Electronics Engineering
- Computer Science & Engg.

Solapur University, Solapur

Ph.D. Course Work

Electronics and Telecommunication Engineering

(Faculty of Engineering & Technology)

Paper II– Advances in Electronics and Telecommunication Engineering



Examination scheme: Theory paper: 100 marks (3 hrs duration)

**UNIT-1: Advanced Topics in Signal Processing**

Modeling different Signals and systems, various transforms, System design and Implementation issues, DSP architectures and related issues, Evaluation parameters for the various applications.

**UNIT-2: Communication Network**

Various IEEE standards, Performance issues, Trade-offs, Network architectures, Security algorithms with their performance measures.

**UNIT-3: Wireless & Broadband Communication**

IEEE/ITU/ ETSI communication standards and specifications, various trade-offs in functionality, implementation, Transmitter/Receiver architectures and related issues, Wireless embedded approach, Antennae and front end design issues.

**UNIT-4: Wireless Sensor Networks**

Enabling Technologies, Hardware, Wireless Networking, Collaborative Signal Processing, Evolution of Sensor Nodes, Military Networks of Sensors, Next Generation Wireless Sensor nodes, Applications of Interest, Data Gathering Applications, Computation-Intensive Applications, Research Topics and Challenges-Data-centric paradigm, Collaborative information processing and routing, Energy-efficient design, Network discovery and organization.

**UNIT-5: Advanced topics in VLSI Design**

HDL programming, PLDs, floating point arithmetic, multipliers, modeling a sequential machine, Barrel shifter, HDL models for memories and buses, Chip architecture, Clock & power related issues, SRC, DRC, I/O architectures, Wire parasitic, Design validation, MEMs.

**UNIT-6: Human Machine Interface**

Different techniques used for HMI, Algorithms, Related issues and constraints, Performance issues, Applications.

*References:*

1. M.J. Roberts, "Signals and Systems", Tata McGraw Hill Publications, 2003.
2. Gold B., "Speech and Audio Signal Processing", John Wiley Publications.
3. Proakis J.G., "Digital Signal Processing", PHI Publications.
4. Yang Yu, Viktor K Prasanna, Bhaskar Krishnamachari, "Information processing and Routing in Wireless sensor networks", World Scientific Publishing Co. Pvt. Ltd.
5. Baker R.J., "CMOS: Circuit Design, Layout and Simulation", IEEE Press Publication.
6. Lee K., "Semiconductor Device Modeling For VLSI", PHI Publications.
7. Maxfield C.M., "The Design Warriors Guide to FPGA", Elsevier Publications, Amsterdam.
8. Pires, J. Norberto, "Human Machine Interface for Industrial Robotic Cells", Springer Publications.



**Solapur University, Solapur**  
**Ph.D. Course Work**  
**Electronics and Telecommunication Engineering**  
**(Faculty of Engineering & Technology)**



**Paper III – Elective I - Advanced Development in Wireless Communication  
& Coding Technique**

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Examination scheme: Theory paper: 100 marks (3 hrs duration)

**Unit 1** - Introduction wireless network, differences between wireless and fixed telephonenetwork, development of wireless network, wireless data services, traffic routing in wireless network,

**Unit 2** - Wireless systems and standards, AMPS and ETCS, GSM, CDMA digital cellularstandards, Reverse CDMA channel

**Unit 3** - CT2 standard for Cordless telephone, Digital European Cordless standards, Personalcommunication systems

**Unit 4** - Waveform coding, types of error control, structured sequences ,convolutional encoding ,convolutional decoding algorithms

**Unit 5** - Channel capacity, need of better codes, Turbo codes – encoding with interleaving, interleaver design, Turbo decoder, Trellis diagram.

**Unit 6** - Modulation coding tadeoff

Modulation and coding for band limited channel, trellis coded modulation, serial and parallel concatenation of trellis coded modulation

**References:**

1. Wireless communications second edn. By Theodore S .Rappaport (Pearson )
- 2 . Digital communication by Bernard Sklar Second Edition Pearson Education
- 3 . Digital and Analog communication systemss by K. Sam Shanmugham
4. Mobile and Wireless communication Security by BastPreneel

Solapur University, Solapur

Ph.D. Course Work

Electronics and Telecommunication Engineering

(Faculty of Engineering & Technology)

Paper III – Elective -II – Advanced Development in Signal Processing

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Examination scheme: Theory paper: 100 marks (3 hrs duration)

### Unit 1 – Introduction

Convolution, deconvolution, correlation, Probability Density Function, Power Spectrum Estimation, MMSE, criteria.

### Unit 2 – Discrete Time Signal Processing

Discrete Fourier Transform, Inverse Discrete Fourier Transform, Discrete Cosine Transform, Inverse Discrete Cosine Transform, Orthogonal Transform, Discrete Wavelet Transform, Inverse Discrete Wavelet Transform.

### Unit 3 – Optimum Linear Filter

Properties of Linear Prediction (Forward, Backward) error filter, Levinson's Durbin Algorithm, Wiener Filter, Weiner- Hopf equation, error performance, channel equalization.

### Unit 4 – Speech Signal Processing

Short Time Speech Analysis, Time Domain Parameters, Frequency (Spectral) Domain Parameters, Spectral Estimation Methods, Nature of Interfering Sounds, Speech Enhancement Techniques, Spectral subtraction.

### Unit 5 – Image Signal Processing

Fundamentals of Gray Scale and Colour Images, Image Acquisition, Image Transforms, Image Enhancement in Spatial and Frequency Domain, Noise Models, Segmentation.

### References:

1. Digital Signal Processing Principles, Algorithms & applications by John Proakis & Dimitris Manolakis, 4<sup>th</sup> edition.

2. Adaptive Filter Theory by SimenHaykin, 3<sup>rd</sup> edition
3. L.R. Rabiner and R.E Schafer : Digital processing of speech signals, Prentice Hall.
4. Speech Communications Human & Machine by Douglas O'Shaughnessy, 2<sup>nd</sup> edition.
5. Digital Image Processing by R.C. Gonzalez, R.E. Woods, Pearson Education, 2<sup>nd</sup> edition.
  
6. IEEE Transactions on Signal Processing.

Solapur University, Solapur

Ph.D. Course Work

Electronics & Telecommunication Engineering

(Faculty of Engineering & Technology)



**Paper III – Elective -III – Advanced Development in Image Processing**

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Examination scheme: Theory paper: 100 marks (3 hrs duration)

Unit I- **Mathematics of Digital Images:** Vectors and matrices: Vectors and handedness, Matrices and determinants, Further products of vectors in 3-space, The matrix of a transformation, Permutations and the proof of Determinant Rules, Matrix algebra, Introduction to eigenvalues, Rank, and some ramifications, Similarity to a diagonal matrix, The Singular Value Decomposition (SVD)

Unit II – **Basics of Image and Image Processing:** Pixels and relationship, Image enhancement in spatial and frequency domain, Image Restoration, Fourier and wavelet transforms. Color Image Processing: Introduction to terminologies in CIP, Color Spaces and color Distances, Color Image Formation

Unit III- **Color Image Enhancement:** Color image enhancement, Edge detection in color image, Color image segmentation.

Unit IV – **Texture:** Statistical texture descriptors, syntactic texture descriptors, hybrid texture description methods, texture recognition method applications

Unit V- **Image Analysis:** Patterns and pattern classes, Recognition based on decision theoretic methods.

Unit VI - **Image Processing Applications with MATLAB:** Image Processing Toolbox-features, functions for reading, writing and displaying images, transforms, filters, analysis, enhancement. **Applications:** (a) Adaptive Noise Filtering using Back Propagation, Neural Network, Approach, M-file for Noise Filtering Using ANN, Program Illustration, (b) Binary Image Rotation Using Transformation Matrix, Algorithm, M- program for Binary Image Rotation with 45 Degree, Anticlockwise Direction, (c) Clustering Texture Images Using K-means Algorithm, Approach, M-program for Texture Images Clustering.

References:

1. Digital Image Processing, By Rafael C. Gonzalez, Richard E. Woods, Pearson Education, second / Third Edition
2. Digital Image Processing using MATLAB, By Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Pearson
3. Digital Color image processing, By Andreas Koschan ,MongiAbidi, WILEY international publication.
4. Pattern classification, By Duda, Hart, stock, 2<sup>nd</sup> Edition.
5. Mathematics of Digital Images: Creation, Compression, Restoration, Recognition, By S. G. HOGGAR, *University of Glasgow, Cambridge University Press 2006.*
6. Algorithm Collections for Digital Signal Processing Applications Using MATLAB, by E.S. Gopi, *National Institute of Technology, Tiruchi, India,* Published by Springer.