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दुरध्वनी (ईपीएबीएक्स) २६०९००० (अभ्यास मंडळे विभाग– २६०९०९४)
फॅक्स : ००९१-०२३१-२६९१५३३ व २६९२३३३.e-mail:bos@unishivaji.ac.in

Estd. 1962
NAAC 'A' Grade
MHRD NIRF-28th Rank

जा.क्र / एस.यु. / अ.मं / 815 दि. 04 / 05 / 2017

प्रति,

अधिविभागप्रमुख / समन्वयक / संचालक सर्व अधिविभाग, शिवाजी विद्यापीठ, कोल्हापूर	प्राचार्य, सर्व संलग्नित महाविद्यालये व मान्यताप्राप्त संस्था, शिवाजी विद्यापीठ, कोल्हापूर

विषयः– एम.फील. पी.एच.डी. प्रवेश परीक्षेच्या अभ्यासक्रमाबाबत.

महोदय / महोदया,

उपरोक्त विषय संदर्भात आपणांस आदेशान्वये कळविण्यात येते की, विद्यापीठ अनुदान आयोगाच्या अधिसुचनेच्या अनुषंगाने एम.फील. पी.एचडी. प्रवेश परीक्षेसाठी विषयनिहाय अभ्यासक्रम तयार केले असून त्यांना विद्यापीठ अधिकार मंडळाने मान्यता दिली आहे. सोबत त्याची सॉफ्ट कॉपी जोडली आहे.

उपरोक्त अभ्यासक्रम शैक्षणिक वर्ष 2017–18 पासून लागू करण्यात आले असून ते विद्यापीठाच्या www.unishivaji.ac.in या संकेतस्थळावरही उपलब्ध करण्यात आले आहेत. तसेच सदर अभ्यासक्रमांसाठीचे प्रश्नपत्रिकेचे स्वरूप, Standard of passing इ. नियम एम.फील. पी.एच.डी. च्या प्रवेश पुस्तक (Prospectus) सन 2017–18 मध्ये उल्लेख केल्यानुसार राहतील.

सबब, उपरोक्त बाब सर्व संबंधित शिक्षक व विद्यार्थ्यांच्या निदर्शनास आणावी.

कळावे,

आपला विश्वासु,

उपकुलसचिव

सोबत : वरीलप्रमाणे

प्रतः 1. प्र. अधिष्ठाता, सर्व विद्याशाखा
2. पीजीबीयुटीआर विभाग
3. परीक्षक नियुक्ती विभाग
4. बी.एस्सी. विभाग
5. आय.टी. सेल

यांना माहितीसाठी व पुढील योग्य त्या कार्यवाहीसाठी.

SHIVAJI UNIVERSITY KOLHAPUR

M.Phil., Ph.D. Entrance Exam (Subject) Syllabus

Implemented from Academic Year 2017-18

Important Note: Nature of Question Paper, Standard of passing & other rules shall be applicable as per new M.Phil./Ph.D. Prospectus for the Academic Year : 2017-18.

Botany

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.

Tools for searching research topic – books, journals, internet, discussions etc.

Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.

Ethics in research – plagiarism

Unit 3: Data analysis - variables, numerical, categorical

Central measures (mean medium and mode)

Dispersion measures (ranges, standard deviation), probability co-relation and regression, Binomial position and normal distribution, parametric and non parametric tests t - test, f – test, chi-square test, ANOVA.

Unit 4: Tools & Techniques

1. Microscopy : - Light microscopy, Fluorescence microscopy, Electron microscopy
2. Spectrophotometer
3. Cultivation of microbes: Algae, Fungi & Bacteria.
4. Plant cell culture.

5. Preservation techniques: Histochemical and Cytochemical preservation, Herbarium preparation.

Reference Books:

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition, New Age International Publishers Pvt Ltd, New Delhi, 2004.

2. Syllabus for SET Examination Part I

Reference Books:

P. N. Arora and P. K. Malhan (1998). Biostatistics. Himalaya Publishing Bombay.

P. S. G. Kumar (2004). Research methods and statistical techniques B. R. publishing Academy, Udaypur, 192.

G. B. N. Chainy, G. Mishra and P. K. Mohanty(2004) Basic Biostatistics. Kalyani publisher.

N.Gurumani (2006).Research Methodology for Biological Sciences. MJP publishing, Chennai.

C. R. Kothari (2004). Research Methodology- Methods and Techniques, New Age Publ. Wiely Easten, 1985.

Dawson, Catherina (2002). Practical Res. Methods. New Delhi. UBS Publ.

Kumar Ranjit(2005). Res. Methodology. A step by step Guide for Begianers. Singapore, Pearson Education.

Goswami H. K. and R. Goswami. Practical cytology, applied genetics and Bio-statistics Himalayan Publ. House, Bombay (1993)

M. A. Schwer and Zeclinskin publ. Academic Press New York (1989) : Methods in plant molecular biology

Jensen. Leagood and Long Chapman and Hall Publ. (1993): Plant histochemistry –

J. Arditti and Dunn, Publ. Academic Press (1970).Experimental plant physiology –

Techniques in Bioproductivity and photosynthesis by – Coombs, Hall, Long and Sourlock,

Pergamon press Oxford (1985) :Methods in enzymology – Colowick and Kaplan Academic Press.

S. K. Jain and R. R. Rao (1964): Handbook of field and herbarium techniques.Practical Biochemistry

E. Wilson and J. Walker (2000) :Principles and Techniques. EdCambridgePublH. N. (1961): Studies in Paleobotany-Andrews,) Boyer, R.(2005) Modern Experimental

Biochemistry-. Pearsa, Education, Singapore.Ralph, R. (1975). Methods in Experimental Biology.-Blakie, LondonMungikar, A. M. (1997), An Introduction to Biometry-Saraswati Printing Press Aurangabad

Kothari C Rand GargGaurav 2014 : Research Methodology Methods and Techniques, IIIrd Ed. New Age International Publishe

Section - II
Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Chemistry

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.
Tools for searching research topic – books, journals, internet, discussions etc.
Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.
Ethics in research – plagiarism

Unit 3 : Research Methods.

Solid State reactions: Preparative methods, vapor phase transport, preparation of thin films, electrochemical methods, chemical vapor deposition, single crystal growth – Bridgman & Stokbarger methods, zone melting, co-precipitation, sol-gel method and hydrothermal method.

Application of following reagents and reaction in synthesis: Complex metal hydrides, lithium diisopropylamide(LDA), Dicyclohexylcarbodiimide(DCC), Trimethylsilyl iodide, Peracids, Diazomethane, Woodward-Prevost hydroxylation and Shapiro reaction.

Raman Spectroscopy: Rayleigh scattering, Raman scattering, classical and quantum theories of Raman effect. Rotational Raman spectra for linear and symmetric top molecules. Vibrational Raman spectra, rotational fine structure. Polarization of light and Raman effect, Structure determination form Raman and Infra-Red spectroscopy.

Colloidal State: Introduction, types and preparation and stability of colloids, properties of colloids and electrokinetic phenomena.

Thermal methods of analysis: Effect of heat on materials, chemical decomposition and thermogravimetry curves, Analysis of thermogravimetry curves. Thermogravimetry in controlled atmosphere, DSC and its applications, thermometric titrations.

Sampling in analysis: Techniques and criteria of sampling, minimization of variables, Sampling of gas, liquids and solids, transmission and storage of samples, high pressure ashing techniques, particulate matter its separation and analysis(asbestos, dust and aerosols), Filtering and gravity separation.

Unit 4 : Research Tools & Techniques

X-ray Fluorescence spectroscopy (XRF): Introduction and basic theory, instrumentation, spectral analysis and applications.

X-ray Photo electron Spectroscopy (XPS): Introduction and basic theory, Instrumentation, sample selection and preparation, spectral analysis, Ar ion sputtering technique and applications of XPS.

Mossbaur Spectroscopy: Introduction, Principles, Condition of Mossbaur spectroscopy, Mossbaur effect, recoilless emission & absorption. Instrumentation, Parameter from Mossbaur spectra ,isomer shift, Quadrapole splitting and hyperfine interactions, application of Mossbaur effect to the investigations of compounds of iron and tin .

Electron spin Resonance [ESR]: Principles of ESR, Selection rule, intensity, width, position of spectral line, multiplet structure, hyperfine interaction, spin orbital coupling, zero field splitting and Krammers degeneracy, rules for interpreting the spectra, Instrumentation, factors affecting G values, applications to inorganic complexes.

Newer methods of stereoselective synthesis: Introduction and Stereoselective and Stereospecific reactions; Enantioselective synthesis (chiral approach) reactions with hydride donors, hydroboration, catalytic hydrogenation via chiral hydrazones and oxazolines, Sharpless epoxidation, Diels Alder selective synthesis, use of calculations of optical purity and enantiomeric excess.

Hückel Molecular Orbital Theory: Hückel molecular orbital theory – Assumptions of HMO theory, the Born-Oppenheimer approximation, electron approximation, Secular determinant and secular equations, Hückel rule and aromaticity, HMO calculations for organic molecules, free valence index and prediction of chemical reactivity, use of molecular symmetry for simplification of HMO calculations, HMO treatment for molecules containing heteroatoms, extended Hückel methods.

Heterogeneous Catalysis: Chemical reactions on surfaces, unimolecular surface reactions, bimolecular surface reactions, Electronic theories of chemisorptions and heterogeneous catalysis. Photocatalysis , Reaction mechanism of photocatalysis Effect of photocatalysis reaction. Heterogeneously catalyzed oxidation and reduction reactions: oxidation of hydrogen with oxygen (Determination of Pt, Pd, Ir and Rh) Reduction of silver bromide (Determination of S and Se)

Cyclic Voltammetry: Introduction, Principle , instrumentation, digital simulation of cyclic Volta grams, excitation signals in voltammetry, Determination of analytes using cyclic voltammetry, Pulse voltammetry, High frequency and High speed voltammetry , applications Stripping voltammetry Electrodeposition step, voltammetric completion of the analysis, adsorptive striping methods, voltammetry with microelectrodes.

Dynamic light scattering (DLS) technique: Introduction, Principle, Instrumentation, sample cell and sample handling, setting velocity and particle size, Stokes equation, Particle size distribution analysis and applications.

Reference books:

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition, New Age International Publishers Pvt Ltd, New Delhi, 2004.

2. Syllabus for SET Examination Part I

Reference Books:

Inorganic Chemistry

1) A. F. Wells, Structural Inorganic Chemistry – 5th edition (1984)

2) J H Huheey, Inorganic Chemisry - Principles, structure and reactivity, Harper and Row Publisher, Inc. New York (1972)

3) J. D. Lee, Concise Inorganic Chemistry, Elbs with Chapman and Hall, London

4) A. R. West, Plenum, Solid State Chemistry and its applications

5) N. B. Hanney, Solid State Physics

6) H. V. Keer, Principles of Solid State

7) S. O. Pillai, Solid State Physics

8) W. D. Callister, Wiley, Material Science and Engineering: An Introduction

9) R. Raghwan, First Course in Material Science

10) R. W. Cahan, The coming of Material Science

11) A. R. West, Basic Solid State Chemistry, 2nd edition

12) U. Schubest and N. Husing, Synthesis of Inorganic Materials, Wiley VCH (2000)

13) M. C. Day and J. Selbin, Theoretical Inorganic Chemistry, Reinhold, EWAP

14) A. H. Hanney, Solid State Chemistry, A. H. Publications

15) O. A. Phiops, Metals and Metabolism

16) Cullen Dolphin and James, Biological aspects of Inorganic Chemistry

17) Williams, An Introduction to Bioinorganic Chemistry

18) M. N. Hughes, Inorganic Chemistry of Biological Processes

19) Ochi, Bioinorganic Chemistry

20) John Wulff, The structure an properties of materials

21) L. V. Azoroff, J. J. Brophy, Electronic processes in materials, Mc Craw Hill

22) F. A. Cotton, R. G. Wilkinson. Advanced Inorganic chemistry

23) Willam L. Jooly, Modern Inorganic Chemistry

24) Manas Chanda, Atomic Structure and Chemical bonding

25) N. N. Greenwood and A. Earnshaw, Chemistry of elements,. Pergamon

26) Chakraburty, Soild State Chemistry, New Age International

27) S. J. Lippard, J.M . Berg, Principles of bioinorganic Chemistry, University Scienc e Books

28) G. L. Eichhron, Inorganic Biochemistry, Vol I and II, Elesevier

29) Progress Inorganic chemistry , Vol 18 and 38, J. J. Loppard, Wiley

Organic Chemistry

1. A guide book to mechanism in Organic chemistry (Orient-Longmens)- Peter Sykes

2. Organic Reaction Mechanism (Benjamin) R. Breslow

3. Mechanism and Structure in Organic chemistry (Holt Reinh.)B. S. Gould.

4. Organic Chemistry(McGraw-Hill)Hendrikson, Cram and Hammond.

5. Basic principles of Organic Chemistry (Benjamin) J. D.Roberts and M. C. Caserio.

6. Reactive Intermediates in Organic Chemistry (John Wiley)N. S. Issacs.

7. Stereochemistry of Carbon compounds. (McGraw-Hill)E.L.Eliel

8. Organic Stereochemistry (McGraw-Hill) by Hallas.

9. Organic Reaction Mechanism (McGraw-Hill) R. K. Bansal.

10. Organic Chemistry- R. T. Morrison and R. N. Boyd,(Prentice Hall.)

11. Modern Organic Reactions(Benjumin) H. O. House.

12. Principle of organic synthesis- R.O.C. Norman and J. M. Coxon.(ELBS)

13. Reaction Mechanism in Organic Chemistry- S. M. Mukharji and S. P. Singh.

14. Stereochemistry of Organic compoundsc) D. Nasipuri.

15. Advanced Organic Chemistry (McGraw-Hill) J. March.

16. Introduction to stereochemistry(Benjumin) K. Mislow.

17. Stereochemistry by P. S. Kalsi (New Age International)

Physical Chemistry

1. Physical Chemistry – P. W. Atkins, Oxford University press, 8th edition, 2006.

2. Text book of Physical Chemistry – S. Glasstone.

3. Principles of Physical Chemistry – Marron and Pruton.

4. Physical Chemistry – G. M. Barrow, Tata-McGraw Hill, Vth edition, 2003.

5. Thermodynamics for Chemists – S. Glasstone, D. Van Nostrand , 1965.

6. Thermodynamics: A Core Course- R. C. Srivastava, S. K. Saha and A. K. Jain, Prentice-Hall of India, IInd edition, 2004.

7. Elements of statistical thermodynamics - L. K. Nash, 2nd Ed. Addison Wesley 1974.

8. Theoretical Chemistry: An introduction to quantum mechanics, statistical mechanics, and molecular spectra for chemists - S. Glasstone, D. Van Nostrand Company, Inc., 1944.

9. An Introduction to Statistical Thermodynamics – T.L. Hill, Addison-Wesley. 1960.

10. Statistical Mechanics – Donald A. McQuarrie, 2000.

11. Physical chemistry of surfaces – A. W. Adamson, 4th Ed. John Wiley, 1982.

12. Introduction to Colloid and Surface Chemistry – D. Shaw, Butterworth Heinemann, 1992. 13. Surface Activity: Principles, Phenomena and Applications (Polymers, Interfaces and Biomaterials) – K. Tsujii, 1st Ed. Academic Press, 1998.

14. Biophysical Chemistry – J.P. Allen, Wiley-Blackwell, 2008.

15. Biophysical Chemistry – A. Cooper, RSC, 2004.

16. Thermodynamics of Biochemical Reactions – R.A. Alberty, Wiley-Interscience, 2003. 17. Textbook of Biophysical Chemistry – U.N. Dash, McMillan India, 2006.

Analytical Chemistry

1. Analytical Chemistry: (J.W) G. D. Christain

2. Introduction to chromatography : Bobbit

3. Instrumental Methods of analysis (CBS)- H.H . Willard, L.L. Mirrit, J.A. Dean

4. Instrumental Methods of Analysis : Chatwal and Anand

5. Instrumental Methods of Inorganic Analysis(ELBS) : A.I. Vogel

6. Chemical Instrumentation: A Systematic approch- H.A. Strobel

7. The principals of ion-selective electrodes and membrane transport: W.E.Morf

8. Physical Chemistry – P.W.Atkins

9. Principal of Instrumental Analysis- D. Skoog and D.West

10. Treatise on Analytical Chemistry: Vol Ito VII – I.M. Kolthoff

11. Computer, Fundamentals-P.K.Sinha

12. Programming in BASIC : E. Balaguruswamy

13. Computer programming made simples : J.Maynard.

Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Computer Science

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.
Tools for searching research topic – books, journals, internet, discussions etc.
Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.
Ethics in research – plagiarism

UNIT 3: Research Methods

Data pre-processing, Design and Analysis of algorithm, Algorithm optimization, Design patterns

UNIT 4: Research tools & Techniques

Cloud Computing, Big Data, Machine Learning, Open Source Software (Weka and R)

Reference Book:

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition, New Age International Publishers Pvt Ltd, New Delhi, 2004.

2. Syllabus for SET Examination Part I

Reference:

1. R.C.Kothari , Research Methodology, New Age international Publisher, Third Edition
2. A.A.Puntambekar, Design And Analysis Of Algorithms, Technical Publications, First Edition, 2010
3. Rajesh Kumar Arora, Optimization: Algorithms and Application, CRC Press,2015
4. Eric Freeman, Elisabeth Robson, Head First Design patterns, O'Reilly Publication, 1st edition, Oct 2004
5. Judith Hurwitz, Robin Bloor, Marcia Kuafman, Fern Halper , Cloud Computing for Dummies, Wiley Publishing, Inc, 2010
6. Kailas jayaswal, jagannath kallakurchi,Donald, Dr. Devan shasha- Cloud computing black book-Kongent dreamtech Press,2015
7. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers

8. Rajkumar Buyya, Christian Vechhiola, S.Thamarai Selvi , "Mastering Cloud Computing ", McGraw Hill Education (India) Private Limited
9. Rajkumar Buyya, James Broberg and Andrzej M.goscinski, "Cloud computing:
10. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015
11. Tom White, Hadoop: The Definitive Guide, O'Reilly, 3rd edition
12. Ryszard Michalski, Gheorghe Tecuci, Machine Learning- A multi strategy approach 1st edition, Feb 1994
13. Michael J Crawley, The R Book, 2nd Edition, Wiley Publication,
14. Data Mining concepts and techniques - Jiawei Han and Micheline Kamber , Third Edition, Morgan Kaufmann Publishers, 2012
15. Data Mining: Introductory and Advanced Topics - Margaret H. Dunham, Pearson education,2006

Section - II
Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Statistics

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.
Tools for searching research topic – books, journals, internet, discussions etc.
Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.
Ethics in research – plagiarism

Unit 3: Research Methods

Combinatorics, Elementary calculus and matrix theory, Methods of data collection, Methods for data analysis, , Method for goodness of fit, Methods based on likelihood principle and Bayesian approach, Numerical methods for finding roots of linear and nonlinear equations, Numerical methods for solving system of equations, Numerical integral.

Unit 4: Research Tools and Techniques

Analytical and simulation techniques for performance evaluation of various statistical procedures in statistical modeling and inference, exploratory data analysis tools, Bootstrap and Jackknife techniques, Algorithms, Data analysis using MS-Excel

Reference Book:

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition, New Age International Publishers Pvt Ltd, New Delhi, 2004.

2. Syllabus for SET Examination Part I

References:

Atkinson, K. E. (1989). An Introduction to Numerical Analysis, Wiley.

Casella, G. and Berger, R. L. (2001). Statistical Inference, 2nd Edition, Duxbury press.

Devroye, L. (1986). Non- Uniform Random Variate Generation, SpringerVerlag, New York.

Dudewicz, E. J. and Mishra, S. N. (1988). Modern Mathematical Statistics, John Wiley & Sons.

Efron, B. and Tibshirani. R. J. (1994). An Introduction to the Bootstrap, Chapman and Hall.

Lehmann, E. L. (1983). Theory of Point Estimation, John Wiley & sons.

Morgan, B. J. T. (1984). Elements of Simulation, Chapman and Hall.

Mukhopadhyay, P. (2015). Mathematical Statistics, Books and Allied (p) Ltd.

Rao, A. R. and Bhimasankaram P. (2000), Linear Algebra, 2nd edition, Hindustan Book Agency.

Rohatgi, V. K. and Saleh, A. K. MD. E. (2015). Introduction to Probability Theory and Mathematical Statistics -3rd Edition, John Wiley & sons.

Rubinstein, R. Y. (1998). Modern Simulation and Modeling, Wiley Series in Probability and Statistics.

Taha, H. A. (1971). Operational Research and Introduction, Macmillan.

Tukey, J. W. (1977). Exploratory Data Analysis, Pearson.

Section - II
Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Mathematics

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.
Tools for searching research topic – books, journals, internet, discussions etc.
Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.
Ethics in research – plagiarism

Unit 3: Research Etiquettes

Principles of Professional Writing: Frozen symbols, Non Alphabetical symbols, size of symbols in kernel-index notations, Principle for the abbreviation of mathematical words, standard abbreviations and meaning, abbreviations of units of measurement. Latin abbreviations, use of assume and suppose.
Syntax: Grammatical concepts in mathematical writing, Punctuation marks in mathematics viz., the comma, the semi-colon, the colon, the full stop etc.

Unit 4: Research Tools & Techniques

Latex: Basics of Latex, simple typesetting, fonts, type size; Document class, page style, page numbering, parts of document; Tables in Latex; Typesetting mathematics: custom commands, symbols, equations, operators etc; Cross references in Latex.
Scilab: Introduction, installation; The console, the editor, using exec; Basic elements of language; Matrices and matrix operations; Looping and branching; Functions; Plotting in Scilab.

Reference Book:

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition, New Age International Publishers Pvt Ltd, New Delhi, 2004.

2. Syllabus for SET Examination Part I

For Unit III:

(3) L. Radhakrishna: Write Mathematics Right Principles of Professional Presentation, Exemplified with Humor and Thrills, Narosa Publishing House, 2013.

For Unit IV;

(4) Latex Tutorials: A Primer, Indian Tex Users Group,
http://sarovar.org/projects/ltxprimer;
http://www.tug.org.in/tutorials.html

(5) Introduction to Scilab, Michael Baudin,

www.scilab.org/content/download/247/1702/file/introscilab.pdf

Section - II
Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Geology Syllabus

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.

Tools for searching research topic – books, journals, internet, discussions etc.

Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.

Ethics in research – plagiarism

Unit 3: Research Methods

Research methods in Hydrogeology, Geomorphology, Structural Geology, Geochemistry-Mineralogy, Petrology, Economic Geology, Stratigraphy, Palaeontology, Engineering Geology and other branches of geology.

Unit 4: Research tools & Techniques

Satellite Imageries, Aerial Photographs, and Field techniques in Geology-, Laboratory techniques Instruments used in research work in Geology, Statistical Methods of Data Analysis, Application of Computer and Software in Geology.

Reference Book:

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition,

New Age International Publishers Pvt Ltd, New Delhi, 2004.

2. Syllabus for SET Examination Part I

Reference Books:

1. Groundwater hydrogeology – D. K. Todd (1980), John Wiley and Sons Inc, NewYork.
2. Groundwater survey and investigation – Gautham Mahajan APH publishers.
3. Hydrogeology – Karanth K R, Tata McGraw Hill Co. Ltd., New Delhi.
4. Principles of Geomorphology: W. D. Thornbury.

5. Indian Geomorphology: H. S. Sharma.
6. Structural Geology: Billings M. P.
7. Structural Geology- Fundamental and Modern Developments: Ghosh, S. K.
8. Introduction to Geochemistry – Mason B and Moore C. B. (1991)
9. Introduction to Geochemistry – Krauskopf K. B and Bird D. K. (1967)
10. Textbook of Mineralogy: E. S. Dana.
11. Igneous and Metamorphic Petrology: M. G. Best.
12. Igneous and Metamorphic Petrology: Philipotts, A., 1992, Prentice Hall.
13. Sedimentary Petrology 3rd edition : Pettijohn, F. J., 1984, CBS Publi.
14. Economic Mineral Deposits: Jensen and Betman
15. Ore Deposits: Gokhale and Rao.
16. Historical Geology and Stratigraphy of India: Ravindra Kumar.
17. Geology of India Vol. I and II : M.Ramkrishnan and R.Vaidyanathan
18. Invertebrate Palaeontology: Woods H.
19. Fundamentals of Micropalaeontology- M.A.Koregave
20. Palaeontology of Vertebrates: Jean Chaline.
21. Geophysical Methods in Geology: Sharma, P.V.
22. Introduction to Geophysical Prospecting: Dobrin, M.B., McGrow Hill.
23. Field Geology: Lahee
24. Engineering and General Geology – By Prabin Singh, S. K. Katariya and sons, Delhi.

In addition to above classical books, ample study material in relevant subjects is available in latest e-books, and various websites on internet.

Section - II
Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Nano Science & Technology

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.
Tools for searching research topic – books, journals, internet, discussions etc.
Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.
Ethics in research – plagiarism

Unit 3: Research Methods:

Spray pyrolysis, Chemical vapour deposition, Physical vapor deposition, Electro spinning, SILAR, Anodization, Electrodeposition, Hydrothermal, solvothermal, Biosynthesis of nanomaterials (phyto chemicals &microganisms), Sol-gel

Unit 4 :Research tool & Techniques:

UV-visible spectrophotometry, InfraRed Spectroscopy, Ramom Spectroscopy, Optical microscopy, Electron microscopy, X-ray diffraction, Photo luminescence, Chromatography, electrophoresis, Zone inhibition technique, Cyclic Voltammetry, Contact Angle measurement technique.

Reference Book:

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition, New Age International Publishers Pvt Ltd, New Delhi, 2004.

2. Syllabus for SET Examination Part I

Reference Books:

1) Thin Film Phenomena, K L Chopra, Tata Mc-Graw Hill publication
2) Fundamentals of molecular spectroscopy, C N Banwell, tat Mc Graw Hill publication
3) Elements of X-ray Difraction, BD Cullity, Prentice Hall publication.
4) Fundamentals of Electrochemistry, AJ Bard, John Wiley and Sons publication.
5) Spectroscopy of organic compounds, PS Kalsi, New Age International Pvt. Ltd. publication.
6) Introduction to Nanoscience and Nanotechnology, G. Honyark and Joydeep Dutta, CRC Press.

Section - II
Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Biochemistry/ Biotechnology/Environmental Biotechnology

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.

Tools for searching research topic – books, journals, internet, discussions etc.

Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.

Ethics in research – plagiarism

Unit 3: Research Methods

Preparation of molar, percent solutions, pH, Buffers, Henderson Hasselbalch equation, Beer Lamberts Law, Enzyme assays, Principles of protein, carbohydrate, lipid and nucleic acid estimations, Isolation and characterization of protein, DNA, RNA and plasmids. Basics of microscopy.

Unit 4: Research tools & Techniques

Priciples and methods for -

Cell Homogenization techniques

Chromatography – ion exchange, gel filtration, affinity, HPLC, paper and TLC.

Electrophoresis, Western / Southern / Northern blotting,

Immunological techniques – Radial immunodiffusion, Laurell's rocket

Immunoelectrophoresis, ELISA, RIA, BLAST

Reference Book:

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition, New Age International Publishers Pvt Ltd, New Delhi, 2004.

2. Syllabus for SET Examination Part I

Reference Books:

Protein Purification, Robert Scopes, Springer Verlag Publication, 1982.

Practical Biochemistry, Vth edition, Keith, Wilson and Walker, Cambridge University Press, 2000

A Textbook of Practical Biochemistry, David Plummer, Tat McGraw Hill, 1988

Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Physics

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.

Tools for searching research topic – books, journals, internet, discussions etc.

Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.

Ethics in research – plagiarism

Unit 3: Research Methods:

Synthesis techniques: Chemical bath deposition, Spray Pyrolysis, Electrodeposition, SILAR, Spin coating, deep coating, Hydrothermal, Solvothermal, Types of RF receivers, Antennas, Magnetometer

Unit 4: Research tools & Techniques:

XRD, SEM, FESEM, AFM, DTA, TGA, Raman, Hall effect, UV-VIS-near IR, microwave, Numerical techniques & error analysis, nuclear detectors, satellites & spacecraft for space applications, SOHO, SDO and GOES

Reference Book:

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition, New Age International Publishers Pvt Ltd, New Delhi, 2004.

2. Syllabus for SET Examination Part I

Reference Books:

1. Basic Microwave Techniques & Laboratory mannual – M. L. Sisotia
2. Antenna theory, analysis & Design – C. A. Balanis
3. Nuclear Detectors – J. F. Kenoll
4. Research methods & techniques – C. R. Kothari
5. Holography & its applications – P. Hariharan
6. Elements of X-ray differaction – B. D. Cullity
7. Automic & molecular spectroscopy – Bandwell

Section - II
Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Food Science and Technology

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.

Tools for searching research topic – books, journals, internet, discussions etc.

Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.

Ethics in research – plagiarism

Unit 3: Research Methods

Variables: Meaning and Types
Research questions
Hypotheses: Concept, Sources and Types
Descriptive Research: Survey, causal-Comparative and Correlation.
Experimental Research: Pre-Experimental and True-Experimental Designs, Factorial Design, internal and external experimental validity and controlling extraneous and intervening variables.
Sampling: Concept of universe and sample, Determining sample size, Techniques of sampling (Probability and Non-Probability Sampling)

Unit 4: Research tools & Techniques

Tools of Data Collection: Rating Scale, Attitude Scale, Opinionnaire, Questionnaire, Aptitude Test, Check List, Inventory, Semantic Differential Scale, Achievement Tests
Techniques of Data Collection: Observation, Interview, Projective
Tool Development:
Validity (Meaning, types, indices and factors affecting validity)
Reliability (Meaning, types, indices and factors affecting reliability)
Item Analysis (Discrimination Index, Difficulty Index)

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition,

New Age International Publishers Pvt Ltd, New Delhi, 2004.

2. Syllabus for SET Examination Part I

Reference Books:

1. Yogesh Kumar Singh (2006). Fundamental of Research Methodology and Statistics. New Age International (P) Limited, Publishers.
2. Mark Chang (2014). Principles of Scientific Methods. A Chapman and Hall Book. CRC Press, Taylor and Francis Group.
3. Marcy A. Kelly, Pryce L. Haddix (2015).The Fundamentals of Scientific Research: An Introductory Laboratory Manual.Wiley-Blackwell.

4. M. Gagan and Sajit Kumar (2015). Trueman's UGC NET/SLET General Paper I. Danika Publishing Company.

Section - II
Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Microbiology

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.
Tools for searching research topic – books, journals, internet, discussions etc.
Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.
Ethics in research – plagiarism

Unit 3: Research Methods

Enrichment, isolation and identification of microorganisms; general principles of fermentation technology and wastewater treatment; primary and secondary screening, strain improvement; biological assay; enzymes, vitamins, and antibiotics; protein and DNA sequencing.

Unit 4: Research Tools and Techniques

Microscopy, staining techniques, fermenter, chromatographic techniques: TLC, paper chromatography, ion-exchange chromatography, gel filtration, affinity, HPLC, electrophoresis. Spectroscopic techniques: UV visible spectrophotometry, GC-MS, LC-MS. Polymerase Chain Reaction (PCR), biological databases, BLAST, phylogeny.

Reference Book:

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition, New Age International Publishers Pvt Ltd, New Delhi, 2004.
2. Syllabus for SET Examination Part I

Suggested Readings:

1. Microbial Technology, Microbial Processes. Second Edition/Volume I by H. J. Peppler, D. Perlman
2. Introduction to Bioinformatics. Atwood, T. K. and Parry-Smith, D. J.
3. Methods of Protein and Nucleic acid Research, Osterman Vol I – III
4. Practical Biochemistry, V ed., Keth, Wilson and Walker
5. Protein Purification by Robert Scopes, Springer Verlag Publication, 1982.
6. Principles of Fermentation Technology 2 nd ed. Stanbury P.F., Whitaker A, and Hall S.J. 1997.

Section - II
Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Electronics

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.

Tools for searching research topic – books, journals, internet, discussions etc.

Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.

Ethics in research – plagiarism

Unit 3: Research Methods

Error analysis pertaining to sensor and systems, Precision, Resolution, Accuracy, Reliability issues related to instrumentation, Statistical analysis of device and system characteristics in Electronics, Energy and power issues of Electronic systems, Modeling, simulation, prototyping of Electronic systems

Unit 4: Research tools & Techniques

Matlab / Scilab, NS3, IE3D, HFSS, Xilinx Web pack, Xilinx EDK, Eclipse for mobile app development, Cloud computing tools, Electronics Workbench, PSPICE/HPSPICE++

Reference Book:

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition, New Age International Publishers Pvt Ltd, New Delhi, 2004.

2. Syllabus for SET Examination Part I

References:

1. Research Methodology: Methods and Techniques, C. R. Kothari, New age international.
2. Getting Started with MATLAB, Seventh edition by Rudra Pratap, Oxford University press
3. IE3D/ HyperLynx manual
4. ISE 10.1 Quick Start Tutorial, https://www.xilinx.com/itp/xilinx10/books/docs/qst/qst.pdf
5. Embedded System Tools Reference Manual, https://www.xilinx.com/support/documentation/sw_manuals/edk10_est_rm.pdf
6. Introduction to PSpice using OrCAD for circuits and electronics, M. H. Rashid, Pearson/Prentice Hall, 2004

Section - II
Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Geography

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.

Tools for searching research topic – books, journals, internet, discussions etc.

Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.

Ethics in research – plagiarism

Unit 3: Research Methods:

i) Nature and types of Geographical Research. ii) Approaches of Geographical research and research problem. iii) Types and sources of data and data collection. iv) Processing and analysis of data. v) Role of computers in Geographical research.

Unit 4: Research Tools and Techniques

i) i) Importance of statistics in Geography ii) Geographical Information system. iii) Indian Toposheet – History, type, importance. iv)Meaning and application of remote sensing. v) Importance of cartography vi) Methods of survey and their types. vii) Importance of weather instruments with structure and features.

ii) Cartographic Techniques: Map Scale and their types, Direction, Scale conversion. Legends, Enlargement and Reduction of Maps

iii) SOI: Indexing, Conventional Signs and Symbols,
References. Contours. Slope. Drainage Pattern

Types of Geographical Data
Analytical methods (Mean, Median, Variance, Standard
Deviation, Skewness and Kurtosis.)
Concept of Probability (Methods of Determination)
Time Series Analysis, Correlation and Regression
Testing of Hypothesis (Parametric and Non-Parametric Tests

iv) Basics of Computer (input and Output Devices)

Map and figures Making Tools and Functions
Use of Excel Software
Excel software; Data Analysis and Graphical Representation.

v) Basic Concepts: Spectrum, Spectral Quantities, EMR, Laws of Radiation, Concept of Blackbody radiation, Spectral Signatures, Scattering, Absorption, Refraction, Path

Radiance Reflection, Transmission, Absorption, Scattering,
Surfaces, Atmospheric Windows

Basics of Ariel Photography, Basics ofSatellite Remote Sensing

Reference Book:

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition,

New Age International Publishers Pvt Ltd, New Delhi, 2004.

2. Syllabus for SET Examination Part I

References:

- Arora P. N. & Arora S (1994): Foundation Course in Statistics, S. Chand and Company Ltd, New Delhi.
- Aslam Mehmood (1976): Statistical Techniques in Geographical studies, Rajesh Publication, New Delhi.
- Derrenberger, R. W. (1971): Geographical Research and Writing, Thomas Y. Cromwell & Co. New York.
- Gibbs J. P. (ed) (1966): Urban Research Methods, D. Van Nostrand Co., Inc Princeton, New Jersey, New York.
- Gregory S. (1963) : Statistical Methods and the Geographer, Longman, London.
- Hagget Peter (1990): Geography: Modern Synthesis. Harper International, New York.
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- Haring L. L. & Loundbury J. F. (1975): Introduction to Scientific Geographic Research. W. C. Brow Company, U.S.A.
- Haring, Lloyedd (1975): Scientific Geographic Research. W. C. Brow Company, U.S.A.
- Kothari C. R. (1996): Research Methodology, Vishwas Prakashan , New Delhi.
- Lillesand & Kiefer (1994): Remote Sensing and Image Interpretation, John Wiley and sons Inc, New York.
- Mishra R. P. (1991): Research Methodology in Geography, Concept Publishing, New Delhi.
- Pugh, Griffith Thomoson (1968): Guide to Research Writing, Houghton Miffin Boston, New York.
- Saha P. & Basu P. (2006): Advanced Practical Geography, Books and allied Pvt. Ltd. , Kolkatta.
- Sarvanavel P. (1998): Research Methodology, Kitab Mahal, Allahbad.
- 21. Thornbury, W.D. (1969): Principles of Geomorphology, Wiley Easterrn Ltd. New Delhi.
- Spark, B. W. (1986): Geomorphology, Longman, London.
- Singh, Savindra (1998): Geomorphology, Prayag Pustak Bhavan, Allahabad.
- Trewartha G.T: An Introduction to climate “McGraw Hill BK Co. New York. 1968
- Critchfield,H.J, 2004 : Principles of Climatology; Prentice Hall, London.
- Das P. K. : The Mansoon, Prayag pustak Bhavan, Allahabad.
- Shastri Rama: Weather and Weather Forecasting, Ministry & Information NBT Delhi.
- Alexander J.W. (1976): Economic Geography, Prentice Hall of India. New Delhi.
- Robinson H & Bamford C. G. (1978): Geography of Transport, Macdonald & Evans USA.

- Misra R. P.: Regional Planning, concepts, New Delhi.
- Clark, J. I. (1972): Population Geography. Pergamon Press, Oxford.
- Chandana, R.C. (1984): Geography of Population, Kalyani Publisher, Ludhiana.
- Trewartha,G.T.(1959): A Geography of Population-World Patterns. John Wiley & Sons Inc. New York.
- Sing R. L. (1996): Map Work & Practical Geography, Central Book Dept. Allahabad.
- Singh & Kanaujia (1973): Map Work & Practical Geography, Central Book Dept. Allahabad.
- N. N. Basak (1994): Surveying and Leveling, Tata McGraw Hill Publishing Company LTD., New Delhi.
- Tiwari, R. C. (2007): Geography of India, Prayag Pustak Bhawan, Allahabad
- Singh, R. L. (ed.) (1971): India. A Regional Geography. National Geographical Society of India, Varanasi.
- Nag, P. and Gupta S. S. (1992): Geography of India. Concept Publishing. Company, New Delhi.
- Ahmad, Aijazuddin (1999): Social Geography, Rawat Publications, Jaipur.
- Smith, David M. (1977): Human Geography- A Welfare approach, Arnold-Hinmann, London.
- Hussain, Majid (1994): Human Geography, Rawat Publications, Jaipur
- Soffer, David E. (ed.) (1980): An Exploration of India: Geographical Perspectives on Society and Culture, Cornell Uni. Press, New York.
- Lawrence, G.R.P. (1973): Cartographic methods, Methuen & Co. London.
- Chandra, R.C. (2000): Regional Planning and Development, Kalyani Publishers, Ludhiana.
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- Campbell, J.B., and Wynne, R.H. (2011): Introduction to Remote Sensing (5th Ed.), Guilford Press, New York, 667pp.
- Reddy, M.A. (2008): Textbook of Remote Sensing and Geographical Information System (3rd Ed.), BS Publications, Hyderabad, 476pp.
- Botkin, D.B., Keller, E.A. (2007): Environmental science: Earth as a Living Planet. John Wiley and Sons, New York.
- Savinder Singh (1991): Environmental Geography. Prayag Pustak Bhavan, Allahabad.
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- Bolstad, P. (2007): GIS Fundamentals: A First Text on Geographic Information Systems (3rd Ed.),
- Eider Press, 620pp. (2008): Fundamentals of Geographical Information Systems (4th Ed.), Wiley, 443pp.
- Dent, B., Torguson, J., and Hodler, T. (2008): Cartography: Thematic Map Design (6th Ed.), McGraw-Hill, 368pp.
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- Blij De H.J., 1972: Systematic Political Geography . Wiley, New York.
- Dixit R. D., 1982: Political Geography. Tata McGraw Hill New Delhi.
- Cech, T.V. (2009): Principles of Water Resources: History, Development, Management, and Policy (3rd Ed.), Wiley, Hoboken, New Jersey, 576pp.

- Pinet, P.R. (2009): Invitation to Oceanography (5th Ed.), Jones and Bartlett Publishers, Sudbury, Massachusetts, 609pp.
- Singh Jasbir & Dhillon S.S (2004): Agricultural Geography, Tata Mc-Graw Hill Education, New Delhi.
- Bhatia B.M. (1977): Poverty Agriculture & Economic Growth, Vikas New Delhi.
- Shafi M. (1983): Agricultural Productivity and Regional Imbalances a Study of Uttar Pradesh, Concept, New Delhi.
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- Singh RY. (1994): Geography of Settlements. Rawat Publications.
- Barry C. (1977): Biogeography – An ecological & evolutionary Approach, Oxford.
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- Hussain Majid (1994): Medical Geography, Anmol pub. New Delhi.
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Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Zoology

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.

Tools for searching research topic – books, journals, internet, discussions etc.

Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.

Ethics in research – plagiarism

Unit 3: Research Methods

a) Forumulating a research problem, scientific statement
b) Experimentation: Roles and limitations, Natural experiments, manipulative experiments, comparative experiments
c) Validity, reliability, uncertainty in research, statistical analysis

Unit 4: Research tools & Techniques

a) Immunochemical techniques
b) Centrifugation techniques
c) Electrophoretic techniques
d) Chromatographic techniques
e) Microscopy- compound, fluorescence, phase contrast, electro microscope.

Reference Book:

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition,

New Age International Publishers Pvt Ltd, New Delhi, 2004.

2. Syllabus for SET Examination Part I

References:

1. Research methodology : The aims, practices and ethics of science By Peter Pruzan-Springer
2. Principles and Techniques of Biochemistry and Molecular Biology by Keith Wilson and John Walker.

Section - II
Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Mechanical Engineering
Research Methodology
Section I

(50% Part of Entrance Examination for Ph.D. Admission)

AN INTRODUCTION TO RESEARCH METHODOLOGY:
Meaning, Objectives & Motivation of Research, Types of Research, Research Process, Identifying and Defining the Research Problem, Literature survey /review and its importance, Ethical aspects, IPR issues like patenting, copyrights etc.

CONCEPTUALISING A RESEARCH DESIGN:
Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Sampling Design, Implications of a Sample Design, Criteria of Selecting a Sampling Procedure, Different Types of Sample Designs

DATA COLLECTION, PROCESSING AND ANALYSIS:
Measurement in Research, Measurement Scales, Tests of Sound Measurement, Scaling, Scale Classification Bases, Important Scaling Techniques, Scale Construction Techniques, Different Methods of Data Collection, Difference between Questionnaires and Schedules, Collection of Secondary Data, Processing Operations, Elements/Types of Analysis, Data Processing Operations, Elements of Analysis, Statistics in Research, Measures of Dispersion, Measures of Skewness, Regression Analysis, Correlation, Sampling Fundamentals

HYPOTHESIS:
Introduction to Hypothesis, Procedure for Hypothesis Testing, Parametric and nonparametric Hypothesis test, Testing of hypothesis using various tests like Analysis of Variance and Covariance (ANOVA and ANOCOVA), Chi square test, Multivariate analysis,

INTERPRETATION AND REPORT WRITING
Research Report, Mechanics of Writing a Research Report, Research Paper writing, Layout of research paper, Paper publishing, Impact factor, Citation & Acknowledgements

BOOKS RECOMMENDED:
Research Methodology – C.R.Kothari
Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
Business Research Methods – Alan Bryman& Emma Bell, Oxford University Press.

Section II(Subject specific Syllabus)

Remaining 50% shall be based on Subject Specific as mentioned below

A. Design Engineering

Mathematical Modeling and Design Optimization
Concept of modeling, Types of Modeling, Classification of mathematical modeling, Use of Analogy, Data consideration and Testing of Models, Modeling of dynamic systems with differential equations, simulation of data in the form of mathematical equations, Linear-Non-linear equations, determining the Unknowns of Equations using Least Square Criterion, Process of Simulation, Steps and Features of Simulation Experiments and their Validation.

Advanced Design Engineering

Analysis of variance, factorial design and regression analysis, Reliability theory, design for reliability, Hazard analysis and fault tree analysis. Fatigue strength, factors affecting fatigue behavior, Cumulative fatigue damage, fatigue under complex stresses, mechanism of creep of material at high temperature, Exponential creep law, hyperbolic sine creep law, stress relaxation, bending etc. Optimization: Introduction, multivariable search methods, linear & geometric programming, structural and shape optimization and simplex method. Design for brittle fracture, Design for fatigue failure, Design for different machining process, assembly & safety etc.

Advanced Engineering Materials

Metals and alloys: ferrous and non-ferrous, plastics and polymers, ceramics and composites. Heat treatment of ferrous and non ferrous alloys for modification of structure and properties, smart materials, shape memory alloys, Non Metallic Materials- Polymer materials, formation of polymer structures, production techniques of fibers, foams, adhesives and coatings. Composites: Fibers-glass, boron, carbon, organic, ceramic and metallic fibers-matrix materials polymers, metals and ceramics. Selection of Materials: selection for mechanical properties, strength, toughness, fatigue and creep.

Advanced Theory of Vibrations

Fundamentals of free and forced vibrations, Single and two degree of freedom systems, Vibration absorbers and isolators, Multi degree freedom, Vibration of continuous systems, Experimental methods in vibration analysis, Free and Forced Vibration tests. Non-Linear Vibrations: Sources of nonlinearity, Qualitative analysis of nonlinear systems. Random Vibrations: Random phenomena, Time averaging and expected value, Frequency response function, Probability distribution, Correlation, Power spectrum and power spectral density, Fourier transforms, FTs and response.

B. Heat Power Engineering

Advanced Fluid Mechanics

Concept of Continuum & Fluid, Mass conservation in differential and integral forms, Laminar and Turbulent flows, Viscous flow at different Reynolds number-wake frequency, Navier-Stokes Equations, fully developed flow in channel, pipe, flow between concentric rotating cylinders, Boundary Layers, hydrodynamic stability, velocity profile over a flat plate and in pipes. Turbulent Shear Flows: Equations for free shear layers: mixing layer, plane and axisymmetric jet, wake. Turbulent energy equation, two equation model(k-epsilon), Large Eddy Simulation, Various Turbulent Models , 2-dimensional flows (subsonic and supersonic) past slender bodies, compressible boundary layers.

Advanced Thermodynamics and Combustion

General Relations involving internal energy, enthalpy and entropy, Thermodynamics Relations involving specific heat , Joule Thomson Coefficient, Developing Tables of Thermodynamics properties from experimental data. Equation of state for real gases, derivation of ideal gas laws from kinetic theory, statistical thermodynamics, Mixtures and Solutions. Combustion basics and Combustion Theories, combustion in closed and open systems, application to boiler, gas turbine combustors and rocket motors.

Advanced Heat Transfer

Differential Equation of Heat conduction in Cartesian conduction Cylindrical and Spherical coordinates of isotropic and anisotropic materials, recent advances in Fins, their material and Heat Transfer enhancement Technique, Mathematical analysis of two-dimensional Heat Conduction, Lumped Heat Capacity system, free convection from vertical planes and cylinders, Horizontal plates and cylinders, inclined surface. Radiation mechanism, properties, Shape factor, Shields, Radiation heat exchange between non black bodies. Radiation network for an absorbing and Transmitting, Reflecting and absorbing media. Condensation and boiling enhancement techniques, heat transfer correlations for pool and flow boiling.

Design of Heat Transfer Equipments

Design of Shell and Tube Heat Exchangers, Boiler furnace design, Design of Steam Condenser and evaporative condensers, Design of surface and evaporative condensers, cooling tower, performance characteristics.

C. Production Engineering

Advanced Manufacturing Processes

Forging, rolling, extrusion, wire drawing, sheet metal processes, Types of prototypes, principles and advantages and different types of generative manufacturing processes, viz. stereolithography, FDM, SLS etc. non-conventional machining processes, Principle and theory of material removal. Process parameters, advantages, limitations and applications of ultrasonic machining, laser beam machining and electrochemical machining.

Metal Forming Technology

Mechanics of metal working, stress strain relationship, yield criteria, Equilibrium in Cartesian, cylindrical and spherical coordinates, Slab method and lower and upper bond methods for load, their significance in investigating and modeling of metal working operations; plastic work, work hardening, strain rate and temperature, deformation zone geometry, formability, forming limit diagrams. Forging die design: Design principles, Preform design considerations, Die materials. Theories of cold rolling, hot rolling, torque and power, Roll pass design. Analysis of the extrusion process, cold Extrusion and cold forming, hydrostatic extrusion, extrusion of tubing, Production of seamless pipe and tubing.

Advanced Casting Technology

Review of conventional method of casting and pattern design, pattern and die design considerations, , advanced materials for patterns and dies - selection and applications, High pressure molding technology, flask less molding technology, magnetic molding, Process parameters for Die casting gravity, pressure and low pressure, Centrifugal casting, Vacuum casting, Investment casting, Squeeze casting; Melting technologies for steels, grey C.I., S.G. iron and compacted graphite iron, Al-Si alloys, Magnesium and Titanium based alloys; Casting defects and their classification, rejection analysis, remedial measures.

Production, Operation and Project Management

Relation between production and operations and other functions, products and services, impact of information technology on productions and operations management, Business strategy- competitive priorities, developing operations strategy, productivity and competitiveness. Traditional and concurrent product design, designfor manufacture, service, assembly, Design of services,Quality of design,cost of quality,Forecasting Methods,Production Planning,Scheduling,Theory of Constraints,Foundations of Project Management, Project Life Cycle, Project Environment, Project Selection, Project Proposal, Project Scope,Work Breakdown Structure, Network Scheduling, Critical Path Method, Program Evaluation and Review Technique, Planning and Scheduling of Activity Networks, Assumptions in PERT Modeling, Time-cost Trade-offs Scheduling with limited resources, Resource Planning, Resource Allocation, Project Schedule Compression, Crashing ,Estimation of Project Costs, Earned Value Analysis,Monitoring Project Progress, Project Appraisal and Selection, Recent Trends in Project Management.

Electrical Engineering

Research Methodology

Section I

(50% Part of Entrance Examination for Ph.D. Admission)

AN INTRODUCTION TO RESEARCH METHODOLOGY:
Meaning, Objectives & Motivation of Research, Types of Research, Research Process, Identifying and Defining the Research Problem, Literature survey /review and its importance, Ethical aspects, IPR issues like patenting, copyrights etc.

CONCEPTUALISING A RESEARCH DESIGN:
Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Sampling Design, Implications of a Sample Design, Criteria of Selecting a Sampling Procedure, Different Types of Sample Designs

DATA COLLECTION, PROCESSING AND ANALYSIS:
Measurement in Research, Measurement Scales, Tests of Sound Measurement, Scaling, Scale Classification Bases, Important Scaling Techniques, Scale Construction Techniques, Different Methods of Data Collection, Difference between Questionnaires and Schedules, Collection of Secondary Data, Processing Operations, Elements/Types of Analysis, Data Processing Operations, Elements of Analysis, Statistics in Research, Measures of Dispersion, Measures of Skewness, Regression Analysis, Correlation, Sampling Fundamentals

HYPOTHESIS:
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BOOKS RECOMMENDED:
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Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
Business Research Methods – Alan Bryman& Emma Bell, Oxford University Press.

Section II(Subject specific Syllabus)

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Electrical materials, Magnetic materials. Insulating materials. Maxwell's equations.
Circuit theory. Transient and steady state response. Properties of network in terms of poles and zeros.
Current, Voltage, Power, PF, Harmonics measurement. Transducers for measurement of non-electrical quantities. Digital measurement techniques and data acquisition.

Mathematical modeling of physical systems. Time domain and frequency domain analysis of linear dynamical system. Errors for different type of inputs and stability criteria for feedback systems. Stability analysis using Routh-Hurwitz array, Nyquist plot and Bode plot. Estimation of gain and phase margin. Basic concepts of compensator design. State variable matrix and its use in system modeling and design. Sampled data system and performance of such a system with the samples in the error channel. Stability of sampled data system. Elements of non-linear control analysis.
Design of Power transformers. Construction and testing. Equivalent circuits. Losses and efficiency. Regulation. Auto-transformer, 3-phase transformer. Parallel operation.
Basic concepts in rotating machines. EMF, torque, Construction and operation, leakage losses and efficiency.
DC Machines. Construction, Excitation methods. Circuit models. Armature reaction and commutation. Characteristics and performance analysis. Generators and motors. Starting and speed control. Testing, Losses and efficiency.
Synchronous Machines. Construction. Circuit model. Operating characteristics and performance analysis. Synchronous reactance. Efficiency. Voltage regulation. Salient-pole machine, Parallel operation. Hunting. Short circuit transients.
Induction Machines. Construction. Principle of operation. Rotating fields. Characteristics and performance analysis. Determination of circuit model. Circle diagram. Starting and speed control. Fractional KW motors. Single-phase synchronous and induction motors.
Power Electronic devices. Converters and Inverters. Choppers, FACTS.
Types of Power Stations, Economics and operating factors.
Power transmission lines. Modeling and performance characteristics. Voltage control.
Load flow studies. Optimal power system operation. Load frequency control.
Symmetrical short circuit analysis. ZBus formulation. Symmetrical Components. Per Unit representation. Fault analysis.
Transient and steady-state stability of power systems. Equal area criterion. Power system Transients. Power system Protection Circuit breakers. Relays. HVDC transmission. Power flow over tieline and its control
Analog And Digital Electronics And Circuits voltage regulators and multipliers, Small signal amplifiers, biasing circuits, frequency response and improvement, multistage amplifiers and feed-back amplifiers, D C amplifiers, Oscillators. Large signal amplifiers, coupling methods, push pull amplifiers, operational amplifiers, wave shaping circuits. Multivibrators and flip-flops and their applications. Digital logic gate families, universal gates-combination circuits for arithmetic and logic operational, sequential logic circuits. Counters, registers, RAM and ROMs.
Microprocessor and microcontrollers Instruction set. Interfacing for memory and I/O. Applications in power system protection.
Renewable sources. Restructured power systems. Microgrids and smart grids. SCADA and load dispatch centers.

Automobile Engineering

Research Methodology

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D. Automotive Engines

Engine Basic Theory:

Engine types and their operation, I.C. engines, fuels, actual cycle, air fuel cycle, combustion charts, characteristics of engines, air capacity of engine, valve timing diagram, scavenging and supercharging, MPFI, VVT, cam less engine, Fuel Supply, Ignition. Theory of carburetion and carburetors, mixture, petrol injection, diesel fuel injection pumps, conventional and electronic ignition systems for SI engines, air cooling and water cooling, design aspects, forced feed lubrication system.

Combustion of gaseous and vaporized fuels:

Gas –fired furnace combustion, premixed charge engine combustion, Detonation of gaseous mixture Premixed laminar flames, Gaseous diffusion flames and combustion of a single liquid fuel droplet, Turbulent flames, combustion in two –phase flame systems, Chemically reacting boundary layer flows.

Alternative Fuels:

CNG, LPG, Bio-Diesel, Hydrogen, fuel cells, Eco-friendly vehicles, Electric and Solar operated vehicle Stratified Charged, Low heat rejection engine, Sankey plot, four /

threevalve engine, OHC engine, governing of automobile engine, New engine technology, Recent developments in I. C. engines.

Exhaust Emission Control:

Sources of Emission, Exhaust gas constituents and analysis, Ingredients responsible for air pollution, Smoke, odor, Smog formation. Basic method of emission control, catalytic converter, after burners, reactor manifold, air injection, crank case emission control, evaporative loss control, Exhaust gas recirculation, Fuel additives.

E. Automotive Design

Design of Axles, Propeller Shafts and Drive train:

Design of front and rear axles, Design of Propeller shafts for bending, torsion and rigidity and design of slip joints and U-joints, differential.

Design of Brakes:

Design of Hydraulic Braking System, Internal Expanding Shoe Brake and Disc Brake.

Design of Clutches:

Design requirements of friction clutches, selection criterion, torque transmission capacity, lining materials, Design of single plate clutch, multi-plate clutch and centrifugal clutch.

Design of Gearbox:

Kinematic layout of gearbox, Selection of gear ratios and final drive ratio, center distance Design of gears, shafts, splines and housing, selection of bearings, design considerations of gear shifter.

Design of Suspension System:

General design considerations of suspension system,Design of leaf springs and helical compression for automobile suspension system, Design considerations of Belleville springs, Elastomeric springs, Air (Pneumatic) springs, design considerations of damper and telescopic suspension.

Design of Vehicle Bodies:

Vehicle body materials, Layout of the design, preliminary design, safety, Idealized structure- structural surface, shear panel method, symmetric and asymmetricalvertical loads in car, longitudinal loads.

F. Vehicle Dynamics and Control

Vehicle Aerodynamics:

Objects- Vehicle drag and types, various types of forces and moments, effects of forces and moments, various body optimization techniques for minimum drag,principle of wind tunnel technology, flow visualization techniques, tests with scale models.

Forward Vehicle Dynamics:

Car parked and accelerating on level road and inclined road, tyre stiffness, tyre printforce, effective radius, rolling resistance, longitudinal, lateral, camber and tyre force, engine dynamics, driveline efficiency, gearbox dynamics, clutch dynamics.

Vehicle Vibrations:

Force and Moment, Rigid Body dynamics, Vehicle Coordinate Frame, Force System Acting on aRigid Vehicle Mechanical Vibration Elements, Newton's Method and Vibrations, Frequency Response of VibratingSystems, Vibration Application and Measurement, Lagrange Method and Dissipation Function.

G. Automotive Component Manufacturing

Metal Alloy Systems and Theory of Metal Cutting:
Metals, metallic bonds, crystal structure, alloy formation by crystallization, solidification, cooling curves, Construction of equilibrium diagrams from cooling curves, components of different solubility in liquid and solid state. Tool materials, Tool geometry, Tool life, Taylor's tool life equation, Machinability, Tool failure, Tool wear. Mechanism of metal cutting, Types of chips, Merchant's force diagram.

Gear Manufacturing Processes:
Machining of spur and helical gears on milling machines, gear shaping, gear hobbing, gear shaving, gear burnishing and gear rolling.

Forming:
Elastic and plastic deformation, Concept of strain-hardening, rolling, forging, extrusion, wire and tube drawing.

Sheet Metal Working:

Sheet cutting mechanism, blanking, shearing, piercing, lancing, bending, cup drawing, coining, embossing, Part feeding systems, Punch and die clearances, die elements and types.Mechanical and hydraulic presses, strip layout, calculation of center of pressure, design of press tools for punching, blanking, drawing and bending operations.

Electronics Engineering

Research Methodology

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Section II(Subject specific Syllabus)

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UNIT - I: ELECTRONIC DEVICES
P-N junction diode, Zener diode, Simple diode circuits: clipping, clamping and rectifiers, , BJTs and MOSFETs; Single-stage BJT amplifiers: biasing, bias stability, small signal analysis and frequency response, JFET and its characteristics, Pinch off voltage, Drain saturation current, JFET amplifiers, CS,CD,CG amplifiers ,their analysis using small signal JFET model ,Biasing the FET, The FET. MOSFET amplifiers, LED, photo diode.Principle of Positive and Negative feedback, Concept of Stability in electronics circuits, oscillators and multivibrators, Power Amplifiers.

UNIT - II: ANALOG CIRCUITS
Operational Amplifier: Basic differential Amplifier using transistor and its operation, OP-Amp parameters, characteristic and Definition, Ideal OP-Amp, Equivalent circuit, Inverting and Non-inverting configurations and design,Op-amp Linear and non linear Applications: Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier and applications, Integrator and differentiators, Comparators, Schmitt trigger, , Clipper and Clamper, Precision Rectifier, PLLMultivibrators: Bistable, Monostable, Astablemultivibrator circuits using IC 555, Sample/Hold circuits, Voltage reference circuits; Power supplies: ripple removal and regulation.

UNIT - III: NETWORKS, SIGNALS AND SYSTEMS
Network solution methods: nodal and mesh analysis; Network theorems: superposition, Thevenin and Norton's, maximum power transfer; Wye-Delta transformation; Steady state sinusoidal analysis using phasors ; Time domain analysis of simple linear circuits; Solution of network equations using Laplace transform; Frequency domain analysis of RLC circuits; Linear 2-port network parameters: driving point and transfer functions; State equations for networks.
Continuous-time signals: Fourier series and Fourier transform representations, sampling theorem and applications;
Digital Signal Processing: discrete-time Fourier transform (DTFT), DFT, FFT, Z-transform, interpolation of discrete-time signals; LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay, digital filter design techniques.

UNIT - IV: DIGITAL CIRCUITS &EMBEDDED SYSTEM

Number systems; Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders and PLAs; Sequential circuits: latches and flip-flops, counters, shift-registers and finite state machines; Data converters: sample and hold circuits, ADCs and DACs; Embedded Memories, SRAM, DRAM, 8-bit microprocessor (8085): architecture, programming, memory and I/O interfacing. Serial Communication Interface: UART, SCI applications, Modern SerialInterface Standards, Modems, SPI, I2C, USB, Introduction to JTAG Port

UNIT - V: CONTROL SYSTEM

Basic control system components; Feedback principle; Transfer function; Block diagram representation; Signal flow graph; Transient and steady-state analysis of LTI systems; Frequency response; Routh-Hurwitz and Nyquist stability criteria; Bode and root-locus plots; Lag, lead and lag-lead compensation; State variable model and solution of state equation of LTI systems.

UNIT - VI: COMMUNICATION

Analog communication: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, super heterodyne receivers, circuits for analog communications; Information theory: entropy, mutual information and channel capacity theorem;

Digital communication: PCM, DPCM, digital modulation schemes, amplitude, phase and frequency shift keying (ASK, PSK, FSK), QAM, MAP and ML decoding, matched filter receiver, calculation of bandwidth, SNR and BER for digital modulation; Fundamentals of error correction, Hamming codes; Timing and frequency synchronization, inter-symbol interference and its mitigation; TDMA, FDMA. Communication through Band limited Channel, concept of paralleltransmission, Multi channel and multi carrier CDMA system, fading multipath channel, OFDM, Future trends.

UNIT - VII: ELECTROMAGNETICS

Elements of vector calculus: divergence and curl; Gauss's and stoke's theorems, Maxwell's equations: differential and integral forms. Wave equation, pointing vector, Plane waves: propagation through various media; reflection and refraction; phase and group velocity; skin depth. Transmission lines: characteristic impedance; impedance transformation; Smith chart; Impedance matching; S-parameters, pulse excitation. Waveguides: modes in rectangular waveguides; boundary conditions; cut-off frequencies; dispersion relations. Basics of propagation in dielectric waveguide and optical fibers, Basics of Antennas: Dipole antennas; radiation pattern; antenna gain.

UNIT - VIII: PROBABILITY AND RANDOM VARIABLES:

Axioms of probability, random variables, distribution and density functions, Expected values, moments and characteristic functions, bivariate distributions and functions of two random variables, conditional distributions, joint and conditional densities, joint moments and characteristic function.

Binary hypothesis testing: Bayes, Neyman-Pearson, maximum likelihood, MAP and minimum probability of error criterion, Estimation in communication, Bayes, ML and MAP estimation.

Pharmacy

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Section II(Subject specific Syllabus)

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Pharmaceutical and photo chemistry :
Structure, nomenclature, classification, synthesis, SAR and metabolism of the following category of drugs, which are official in Indian Pharmacopoeia and British Pharmacopoeia. Introduction to drug design and its various methodologies. Stereochemistry of drug molecules. Hypnotics and Sedatives, Analgesics, NSAIDS,

Neuroleptics, Antidepressants, Anxiolytics, Anticonvulsants, Antihistaminics, Local Anaesthetics, Cardio Vascular drugs – Antianginal agents Vasodilators, Adrenergic & Cholinergic drugs, Cardiotonic agents, Diuretics, Anti-hypertensive drugs, Hypoglycemic agents, Antilipedmic agents, Coagulants, Anticoagulants, Antiplatelet agents. Chemotherapeutic agents – Antibiotics, Antibacterials, Sulphadrugs. Antiprotozoal drugs, Antiviral, Antitubercular, Antimalarial, Anticancer, Antiamoebic drugs. Diagnostic agents. Vitamins and Hormones. Eicosanoids and their application. Chemistry, tests, isolation, characterization and estimation of phytopharmaceuticals belonging to the group of Alkaloids, Glycosides, Terpenoids, Steroids, Bioflavanoids, Purines, Guggul lipids. Standardization of raw materials and herbal products. WHO guidelines. Quantitative microscopy including modern techniques used for evaluation. Biotechnological principles and techniques for plant development, Tissue culture.

Pharmaceutics :

Classification and manufacturing of conventional dosage forms like solids, semisolids, liquids. Industrial scale manufacturing of tablets and capsules. Need, design, and development of various type of novel drug delivery systems. Principles underlying design of novel drug delivery systems. Prospects and comparison of sustained and controlled release formulations. Biopharmaceutics and Pharmacokinetics of drug/s and importance in formulation design (conventional and novel). Factors affecting and approaches adopted for bioavailability enhancement of drug/s from oral dosage forms. Formulation and preparation of cosmetics – lipstick, shampoo, creams, nail preparations and dentifrices. Pharmacopoeial and noncompendial standards/limits for development of sterile (parenterals and opthalmics) and non sterile dosage forms, during their life cycle. Pharmaceutical calculations. Principles and methods of microbiological assays as per Pharmacopoeia. Methods of preparation of Pharmacopoeial sera and vaccines. Serological and diagnostics tests. Applications of microorganisms in Bio Conversions and in Pharmaceutical industry. Drugs and cosmetics Act and rules with respect to manufacture, sales and storage. Pharmacy Act. NLEM and CDSCO. Pharmacy Practice Regulation 2015.

Pharmacology :

General pharmacological principles including Toxicology. Drug-drug interaction, drug-disease interactions, drug-food interactions. Pharmacology of drugs acting on Central nervous system, Cardiovascular system, Autonomic nervous system, Gastro intestinal system and Respiratory system. Pharmacology of Autocoids, Hormones, Hormone antagonists, chemotherapeutic agents including anticancer drugs. Bioassays, Immuno Pharmacology. Drugs acting on the blood & blood forming organs. Drugs acting on the renal system. Bioassay development methodologies.

Therapeutic Drug Monitoring Dosage regimen in Pregnancy and Lactation, Pediatrics and Geriatrics. Renal and hepatic impairment. Adverse Drug reactions and side effects.

Pharmaceutical Analysis :

Principles and applications of the following: Absorption spectroscopy (UV, visible & IR). Fluorimetry, Flame photometry, Potentiometry. Conductometry and Polarography. Pharmacopoeial assays. Principles of NMR, ESR, Mass spectroscopy. X-ray diffraction analysis, different modern chromatographic methods, capillary electrophoresis.

Bio- Technology Engineering

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Syllabus for the Qualifying Exam for the Ph.D. Programme

SYLLABUS for Ph.D in Biotechnology Engineering
There will a paper-----
Paper format :
Objective type: 100Marks
This paper will consist of ------- objective type questions of 1 mark each related to basics of the prescribed syllabus for Ph.D. Entrance Test
DETAILED SYLLABUS FOR PAPER- The paper will be set out of the syllabus of the following

Unit: 1

RESEARCH AND ITS METHODOLOGIES

Objectives of research; research process – observation, analysis, inference, hypothesis, axiom, theory, experimentation; Types of research (basic, applied, qualitative, quantitative,analytical etc); Features of translational research, the concept of laboratory to market and Industrial R&D.

Unit: 2

RESEARCH IN BIOTECHNOLOGY

Biological systems and their characteristics that influence the type and outcome of research; Exploratory and product-oriented research in various fields of biotechnology (health, agri,food, industrial etc.). Types of expertise and facilities required; Interdisciplinary nature of biotech research; Sources of literature for biotech research

Unit: 3

EXPERIMENTAL RESEARCH: BASIC CONCEPTS IN DESIGN AND METHODOLOGY

Precision, accuracy, sensitivity and specificity; major experimental variables, biochemical measurements, types of measurements, enzymes and enzymatic analysis, antibodies and immunoassays, instrumental methods, experimental planning – general guidelines

Unit: 4

RESULTS AND ANALYSIS

Importance and scientific methodology in recording results, importance of negative results, Different ways of recording, industrial requirement, artifacts versus true results, types of analysis (analytical, objective, subjective) and cross verification, correlation with published results, discussion, outcome as new idea, hypothesis, concept, theory, model etc. Probability and Statistics: Mean, median, mode and standard deviation; random variables; Poisson, normal and binomial distributions; correlation and regression analysis; tests of significance, analysis of variance (ANOVA).

Unit: 5

GENERAL BIOTECHNOLOGY BIOCHEMISTRY:

Biomolecules-structure and functions; Biological membranes, structure, action potential and transport processes; Enzymes- classification, kinetics and mechanism of action; Basic concepts and designs of metabolism (carbohydrates, lipids, amino acids and nucleic acids) photosynthesis, respiration and electron transport chain; Bioenergetics

Microbiology: Viruses- structure and classification; Microbial classification and diversity(bacterial, algal and fungal); Methods in microbiology; Microbial growth and nutrition; Aerobic and anaerobic respiration; Nitrogen fixation; Microbial diseases and host-pathogen interaction

Unit:6

CELL BIOLOGY:

Prokaryotic and eukaryotic cell structure; Cell cycle and cell growth control; Cell-Cell communication, Cell signaling and signal transduction Molecular Biology and Genetics: Molecular structure of genes and chromosomes; Mutations and mutagenesis; Nucleic acid replication, transcription, translation and their regulatory mechanisms in prokaryotes and eukaryotes; Mendelian inheritance; Gene interaction; Complementation; Linkage, recombination and chromosome mapping; Extra chromosomal inheritance; Microbial genetics (plasmids, transformation, transduction, conjugation); Horizontal gene transfer

and Transposable elements; RNA interference; DNA damage and repair; Chromosomal variation; Molecular basis of genetic diseases

Unit:7

ANALYTICAL TECHNIQUES:

Principles of microscopy-light, electron, fluorescent and confocal; Centrifugation- high speed and ultra; Principles of spectroscopy-UV, visible, CD, IR, FTIR, Raman, MS,NMR; Principles of chromatography- ion exchange, gel filtration, hydrophobic interaction, affinity, GC,HPLC, FPLC; Electrophoresis; Microarray

Unit:8

IMMUNOLOGY:

History of Immunology; Innate, humoral and cell mediated immunity; Antigen; Antibody structure and function; Molecular basis of antibody diversity; Synthesis of antibody and secretion; Antigen-antibody reaction; Complement; Primary and secondary lymphoid organ; B and T cells and macrophages; Major histocompatibility complex (MHC); Antigen processing and presentation; Polyclonal and monoclonal antibody; Regulation of immune response; Immune tolerance; Hypersensitivity; Autoimmunity; Graft versus host reaction.

Unit:9

BIOINFORMATICS:

Major bioinformatic resources and search tools; Sequence and structure databases; Sequence analysis (biomolecular sequence file formats, scoring matrices, sequence alignment, phylogeny);Data mining and analytical tools for genomic and 11 of 72 proteomic studies; Molecular dynamics and simulations (basic concepts including force fields, protein-protein, protein-nucleic acid, protein-ligand interaction)

Unit:10

GENETIC ENGINEERING:

Recombinant DNA Technology Restriction and modification enzymes; Vectors; plasmid, bacteriophage and other viral vectors, cosmids, Ti plasmid, yeast artificial chromosome; mammalian and plant expression vectors; cDNA and genomic DNA library; Gene isolation, cloning and expression ; Transposons and gene targeting; DNA labeling; DNA sequencing; Polymerase chain reactions; DNA fingerprinting; Southern and northern blotting; In-situ hybridization; RAPD, RFLP; Site-directed mutagenesis; Gene transfer technologies; Gene therapy

Unit:11

PLANT AND ANIMAL BIOTECHNOLOGY

Totipotency; Regeneration of plants; Plant growth regulators and elicitors; Tissue culture and Cell suspension culture system: methodology, kinetics of growth and, nutrient optimization; Production of secondary metabolites by plant suspension cultures; Hairy root culture; transgenic plants; Plant products of industrial importance

Animal cell culture; media composition and growth conditions; Animal cell and tissue preservation; Anchorage and non-anchorage dependent cell culture; Kinetics of cell growth; Micro & macro-carrier culture; Hybridoma technology; Stem cell technology; Animal cloning; Transgenic animals & Knockout animals, In vitro fertilization & embryo transfer,

Unit:12

ENGINEERING PRINCIPLE OF BIOPROCESSING:

Upstream production and downstream; Bioprocess design and development from lab to industrial scale; Microbial, animal and plant cell culture platforms; Production of biomass and primary/secondary metabolites; Biofuels, Bioplastics, industrial enzymes, antibiotics; Large scale production and purification of recombinant proteins; Industrial application of chromatographic and membrane based bioseparation methods; Immobilization of biocatalysts (enzymes and cells) for bioconversion processes; Bioremediation-Aerobic and anaerobic processes for stabilization of solid / liquid wastes

Unit:13
FUNDAMNETALS OF MOMENTUM TRANSFER
Fluid definition, Classification, governing equations,Hydrostatic equilibrium, barometric equation,Pressure measurements, Manometric equation, Shear stress, Shear strain, Netwon's law, Fluid flow, Types of flow, Laminar and turbulent flow. Continuity equation, Energy balance equation, Beronulli's equation, Euler equation, Momentum balance, Flow through circular and non circularsections, Hagen-Poiseulles equations, Losses through pipe and fittings, Turbulent flow, and Friction factor.

Unit:14
BASICS OF UNIT OPERATIONS
Basics of Sedimentation, Setting, Filtration, Size reduction, and Mixing. Basic modes of heat transfer, Uni-layer, Multi-layer, and Steady state conduction. Principles of Diffusion, Distillation Drying, Evaporation, Extraction, Adsorption and Iron-exchange operations.

Unit:15
FUNDAMENTALS OF THERMODYANAMICS
System, Surrounding and Process, Closed and Open system, State and Properties, Intensive & Extensive Properties, State and Path functions, Equilibrium state and Phase rule, Zeroth law of Thermodynamics, Heat reservoir and Heat engines, Reversible and Irreversible processes. Generalstatement of First law of Therodynamics, First law for Cyclic Process, Non-Flow Process, Flow process,Heat capacity

Unit:16
BIOREACTION ENGINEERING:
Theories of reaction rates; kinetics of homogeneous reactions, interpretation of kinetic data, single and multiple reactions in ideal reactors, non-ideal reactors; residence time; non-isothermal reactors; kinetics of heterogeneous catalytic reactions; diffusion effects in catalysis.

Unit:17
BASICS OF BIOPHYSICAL AND BIOCHEMCIAL TECHNIQUES
Rayleigh scattering, ultra centrifugation, viscometry, crystallization, X-ray crystallography, neutron diffraction, NMR spectroscopy, electron microscopy, STM,AFM, luminescence, fluorimeter, falme,photometry, optical activity, CD, UV, IR, Laser Raman and ESR, EPR. Calorimetry, DSC,Spectrophotometry, Mass spectrometry, LC-MS, Chromatography, Electrophoresis.
Books

1. Plant cell culture: A practical approach by R.A. Dixon and Gonzales, IRL Press
2. Animal cell culture techniques by Ina Freshney
3. Product recovery in Bioprocess Technology- BIOTOL series 1990
4. Bioseparations – downstream processing for biotechnology by belter P.A., Cussier E. Wiley Interscience pub. 1988.
5. Bioseparations: Principals and Techniques by B. Sivasankar, PHI 2005.
6. Bioprocess technology- Fundamentals and application shuler et.al.
7. Principal of fermentation technology- Stanbury Oxford et.al.
8. Bioprocess Engineering Basics concepts- Shuler et al.
9. Process Biotechnology fundamentals- Mukhopadhya
10. Bioprocess Engineering Principles- Doran Paulin
11. Essentials of Research Design and Methodology Geoffrey R. Marczyk, David DeMatteo, David Festinger, (John Wiley & Sons Publishers, Inc.)
12. Biochemical Calculations: How to Solve Mathematical Problems in General Biochemistry, 2nd Edition, Irwin H. Segel, (John Wiley & Sons Publishers, Inc)
13. Guide to Publishing a Scientific paper, Ann M. Korner, (Bioscript Press).
14. Research Methodology by C. R .Kothari (New Age International)

Electronics and Telecommunication Engineering
Research Methodology
Section I

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Section II(Subject specific Syllabus)

Remaining 50% shall be based on Subject Specific as mentioned below

UNIT - I: ELECTRONIC DEVICES
P-N junction diode, Zener diode, Simple diode circuits: clipping, clamping and rectifiers, , BJTs and MOSFETs; Single-stage BJT amplifiers: biasing, bias stability, small signal analysis and frequency response, JFET and its characteristics, Pinch off voltage, Drain saturation current, JFET amplifiers, CS,CD,CG amplifiers ,their analysis using small signal JFET model ,Biasing the FET, The FET. MOSFET amplifiers, LED, photo diode.Principle of Positive and Negative feedback, Concept of Stability in electronics circuits, oscillators and multivibrators, Power Amplifiers.

UNIT - II: ANALOG CIRCUITS
Operational Amplifier: Basic differential Amplifier using transistor and its operation, OP-Amp parameters, characteristic and Definition, Ideal OP-Amp, Equivalent circuit,

Inverting and Non-inverting configurations and design,Op-amp Linear and non linear Applications: Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier and applications, Integrator and differentiators, Comparators, Schmitt trigger, , Clipper and Clamper, Precision Rectifier, PLLMultivibrators: Bistable, Monostable, Astablemultivibrator circuits using IC 555, Sample/Hold circuits, Voltage reference circuits; Power supplies: ripple removal and regulation.

UNIT - III: NETWORKS, SIGNALS AND SYSTEMS

Network solution methods: nodal and mesh analysis; Network theorems: superposition, Thevenin and Norton's, maximum power transfer; Wye-Delta transformation; Steady state sinusoidal analysis using phasors ; Time domain analysis of simple linear circuits; Solution of network equations using Laplace transform; Frequency domain analysis of RLC circuits; Linear 2-port network parameters: driving point and transfer functions; State equations for networks.

Continuous-time signals: Fourier series and Fourier transform representations, sampling theorem and applications;

Digital Signal Processing: discrete-time Fourier transform (DTFT), DFT, FFT, Z-transform, interpolation of discrete-time signals; LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay, digital filter design techniques.

UNIT - IV: DIGITAL CIRCUITS &MICROPROCESSOR

Number systems; Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders and PLAs; Sequential circuits: latches and flip-flops, counters, shift-registers and finite state machines; Data converters: sample and hold circuits, ADCs and DACs; Embedded Memories, SRAM, DRAM, 8-bit microprocessor (8085): architecture, programming, memory and I/O interfacing.

UNIT - V: CONTROL SYSTEM

Basic control system components; Feedback principle; Transfer function; Block diagram representation; Signal flow graph; Transient and steady-state analysis of LTI systems; Frequency response; Routh-Hurwitz and Nyquist stability criteria; Bode and root-locus plots; Lag, lead and lag-lead compensation; State variable model and solution of state equation of LTI systems.

UNIT - VII: ELECTROMAGNETICS

Elements of vector calculus: divergence and curl; Gauss's and stoke's theorems, Maxwell's equations: differential and integral forms. Wave equation, pointing vector, Plane waves: propagation through various media; reflection and refraction; phase and group velocity; skin depth. Transmission lines: characteristic impedance; impedance transformation; Smith chart; Impedance matching; S-parameters, pulse excitation. Waveguides: modes in rectangular waveguides; boundary conditions; cut-off frequencies; dispersion relations. Basics of propagation in dielectric waveguide and optical fibers, Basics of Antennas: Dipole antennas; radiation pattern; antenna gain.

UNIT - VII: COMMUNICATION SYSTEM

Analog communication: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, DSB, SSB,DSB-SC,SSB-SC,super heterodyne receivers, circuits for analog communications; Information theory: entropy, mutual information and channel capacity theorem;

Digital communication: PCM, DPCM, digital modulation schemes, amplitude, phase and frequency shift keying (ASK, PSK, FSK), QAM, MAP and ML decoding, matched filter receiver, calculation of bandwidth, SNR and BER for digital modulation; Fundamentals of error correction, Hamming codes; Timing and frequency synchronization, inter-symbol interference and its mitigation; TDMA, FDMA.Communication through Band limited Channel, concept of paralleltransmission, Multi-channel and multi carrier CDMA system, fading multipath channel, OFDM, Future trends.

UNIT - VIII: PROBABILITY AND RANDOM VARIABLES:
Axioms of probability, random variables, distribution and density functions, Expected values, moments and characteristic functions, bivariate distributions and functions of two random variables, conditional distributions, joint and conditional densities, joint moments and characteristic function.
Binary hypothesis testing: Bayes, Neyman-Pearson, maximum likelihood, MAP and minimum probability of error criterion, Estimation in communication, Bayes, ML and MAP estimation.

Food Engineering and Technology

Research Methodology

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Section II(Subject specific Syllabus)

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Unit I:

Material and energy balance, Transport Phenomena for food systems, Flow behaviour of non Newtonian fluids, Rheology of dough, Unsteady state Heat Transfer with phase change, Heat transfer during drying and freezing.

Unit II:

Equipment design aspect of evaporators, dryers, freezers. Form Fill Seal, Vacuum and other packaging machines. Materials used for food processing equipment and corrosion control.

Unit III:

Newer techniques in thermal food processing - Retort processing, UHT, Extrusion

Unit IV:

Radio-frequency heating Microwave for food cooking and dehydration, Ohmic heating. Advances in Freezing and refrigeration techniques.

Unit V:

Pulsed electric field, high-intensity light pulses, irradiation technique , thermo-sonication, High hydrostatic processing of foods, super critical CO_2 technique.

Unit VI :

Modified atmosphere, enzymatic processing and hurdle technology. Advanced Membrane Technology for water and liquid foods and effluent treatment.

Advances in Food Science and Nutrition

Unit I:

Chemistry of Carbohydrates: Nomenclature Classification & structure of carbohydrates, Chemical reactions of carbohydrates. Physical & chemical properties of sugars. Chemistry, properties and preparation of Pectic substances, gums & polysaccharides, Starch and its hydrolytic products,maltodextrins, Cellulose, Cyclodextrins

Unit II:

Chemistry of Proteins: Importance of Proteins. Nomenclature, classification, structure and chemistry of amino acids, peptides & Proteins. Sources and distribution of Proteins. Isolation, identification & purity of Proteins. Denaturation. Physical & chemical characteristics of Proteins.

Unit III:

Chemistry of Lipids: Definition & classification of lipids. Basic Structures, Chemistry of fatty acids & glycerides. Components of Fatty acids, Phospolipids, and unsaponifiables, Auto oxidation and hydrolysis, Physical & chemical characteristics of fats & oils, hydrogenated fats, shortening agents, confectionary fats etc. Rancidity of fats & oils, and its prevention, antioxidants.

Unit IV:

Chemistry of water, vitamins and minerals : Importance of water in foods. Structure of water & ice. Concept of bound & free water & their implications..Vitamin stability,Toxicity and sources of vitamins, Bioavailability of vitamins, Reasons for the loss of vitamins in foods. Classification, functional properties and uses of minerals.

Unit V:

Physiological importance of nutrients : Recent advances in biochemistry of food metabolism and nutritional aspects of foods; Nutritional requirements of special group of people such as aged, infants, pregnant & lactating mothers, patients etc. Therapeutic nutrition & formulation of special dietary foods; Relation of food and diseases; Deficiencies of essential nutrients; Assessment of nutritional status & RDA; Effect of processing on nutrients

Unit VI:

Nutraceutical aspects of food: Functional foods and nutraceuticals with attributes to control cardiovascular diseases, cancer, obesity, ageing etc. Food components and nutrients affecting immune systems, behaviour and performance; Functional aspects of dietary fibre, amino acids & peptides, lactic acid bacteria, antioxidants, vitamins, fatty acids etc.

Modern techniques in fruits and vegetable processing

Unit I

Introduction: Importance of fruits and vegetable processing, impact on Indian economy, processing concept

Processing characteristics: Advances in fruits and vegetable selection, grading, sorting, blanching and other pre processing steps in automation of processing line, kinetics of quality changes: physical, chemical, sensory and nutritional changes during processing

Unit II

Thermal processing: Influence of elevated temperature on microbial population, product quality, process time calculation, blanching techniques and purpose of blanching, determination of blanching processes, concept of commercial sterilization, heating and cooling of food in container, influence of commercial sterilization on product quality

Unit III

Juice and pulp extraction – various extractors used including Hydraulic Press -Hot and Cold Break process - Clarification - Clarification centrifuges – Decanters and desludgers. Preparation and packaging of pulps, Jams, Jellies, Marmalades, Squashes. Pickles, Puree, Ketchup, Sauce - Different types Glass and Plastic Containers, Large capacity storage containers in plastic, in plastic and SS containers. Different filling, closing and sterilization operations. Different preservatives used for long and short-term storage

Unit IV

Aseptic processing: Aseptic processing and Bulk packing of Fruit juice concentrates, Pulps and Puree – Brief information on Asepticity and how it is strictly maintained in the plant - Aseptic heat exchangers for sterilizing and concentrating the product - Aseptic fillers. Different system of filling practiced. Tetra pack for small quantities - Dole system and Scholle system for bulk storage in Bag & Boxes and Bag & Drums. - Storage of Aseptically packed products.

Unit V

Drying and Dehydration: Concept of drying and drying curves, state of water in fruits and vegetables, drying effect on product quality and nutritive value, Advances in drying of fruits and vegetables

Specialty products - Fruit Bars , Fruit juice concentrates – methods of concentration - evaporators used for concentration of fruit juices and pulp - Tubular, Plate and scraped surface evaporators and Fruit Powders - Preparation of Fruit material for powder production - Working of Spray Dryer and Drum Dryer - Fruit juice aroma Recovery and its importance.

Unit –VI

Minimally processed fruits and vegetables: Concept of hurdle technology,thermal heating approach to minimal processing, high frequency heating, microwave heating and ohmic heating

Advances in processing of dairy technology

Unit I:

Operation Flood and Dairy Development programmes in India. Physico-chemical properties and structure of milk and milk constituents.

Unit II

Chemical and microbial spoilage of milk and milk products. Methods and procedures for sampling and testing of milk and milk products. Laws and standards for milk and milk products. Milk adulteration.

Unit III:

Fluid milk processing, packaging and distribution products.

Traditional milk based Indian sweets

Unit IV:

Common dairy processes- cream separation (standardization), pasteurization, sterilization and homogenization.

Unit V:

Manufacture of milk products- butter, cream, cheese, ice-cream, evaporated milk, condensed milk, dried milk, butter oil, dried milk products.

Unit VI:

Waste utilization from dairy processing industries. Hygiene and sanitation practices in dairy industry.

Newer developments in bakery and confectionary

Unit I

Current status, growth rate, and economic importance of Bakery and Confectionary Industry in India. Product types, nutritional and safety of products, pertinent standards & regulations.

Unit II

Introduction to baking; Bakery ingredients and their functions; Machines & equipment for batch and continuous processing of bakery products. Bakery and confectionary industry ; raw materials and quality parameters; dough development; methods of dough mixing; dough chemistry; rheological testing of dough- Farinograph, Mixograph, Extensograph, Amylograph/ Rapid Visco Analyzer, Falling number, Hosney's dough stickiness tester and interpretation of the data.

Unit- III

Technology for the manufacture of bakery products – bread, biscuits, cakes and the effect of variations in formulation and process parameters on the quality of the finished product; quality consideration and parameters; Staling and losses in baking.

Unit- IV

Chocolate Processing Technology, Compound coatings & Candy Bars, Tempering technology, Chocolate hollow figures, Chocolate shells, Enrobing technology, Manufacture of candy bars, Presentation and application of vegetable fats. Production of chocolate mass.

Unit- V

Sugar confectionery manufacture, General technical aspects of industrial sugar confectionary manufacture, Manufacture of high boiled sweets- Ingredients,Methods of manufacture- Types-Center- filled, lollipops, coextruded products. Manufacture of gums and jellies- Manufacture of Miscellaneous Products, caramel, Toffee and fudge- Liquorices paste and aerated confectionery, Lozenges,sugar panning & Chewing gum, fruit confections Quality aspects.

Unit- VI

Quality characteristics of confectionery ingredients; technology for manufacture of flour ,fruit, milk, sugar, chocolate and special confectionery products; colour, flavor and texture of confectionery; standards and regulations ; machineries used in confectionery industry.

Recent developments in processing of plantation crops

Unit -I

Plantation Crops - Description of various types of Plantation crops, viz., coconut, arecanut, coffee, tea, cocoa etc. Processing and preservation methods. Value-added products shelf-stable products viz., coconut water bottling, desiccated coconut powder, coffee concentrate, instant coffee powder, instant tea powder, cocoa processing.

Unit -II

Spices & Condiments - Description of various types of spices and condiments, their composition, functional properties, flavouring agents. Nutritive value of spices and their health benefits. In termediate Moisture Products – In termediate Moisture Products viz., ginger paste,ginger – garlic paste, tamarind paste, tamarind concentrate. Their importance in culinary preparations. Flavour retention and packaging methods.

Unit -III

Spice Powders & Curry Powders : Their importance in culinary preparations, their preparation methods, grinding and packaging methods for spice powders like chilli powder, turmeric powder, ginger powder, garlic powder; and Masala Powders for chicken masala, meat masala, biryani masala, chat masala etc. Importance of Cryogenic grinding of spices.

Unit IV

Spice Oils – Concept and importance of spice oils from spices like and condiments like clove, cardamom, cinnamum etc. Their application in food processing, and extraction methods of spice oils by various techniques, viz., solvent extraction, steam distillation etc.

Unit V

Extraction of Oleoresins – Concept and importance of oleoresins in food processing, processing of spices like chilli, turmeric, pepper, ginger etc. for solvent extraction of oleoresins. Oleoresins technology, desolventization methods, regulatory and statutory requirements for oleoresin processing.

Unit VI

Herbs – Description of various types of herbs, viz., Basil, Chives, Cilantro, Dill,Coriander, Mint, Oregano, Parsely, Chives, Borage and Avocada leaves, Rose marry, Saga, Tarragon, Thyme, Winter savory and bolbo leaves, Papalo, Pipicha and Safflower.Their nutritive value & health benefits, their processing and Post harvest handling. Packaging methods for processed products.

INSTRUMENTATION ENGINEERING

Research Methodology

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Section II(Subject specific Syllabus)

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I. SENSORS, TRANSDUCERS & DESIGN

Measurement and Design:- Transducers and design for various parameters like temperature, pressure, flow, level, humidity, acceleration, vibration, density,volume,weight etc
Sensors and Transducers: fiber optics sensors, electromechanical sensors, Solid state chemical sensors, Bio-sensors, Piezo-resistive sensors, Positioning sensors, Thermal sensors, MEMS, Nano sensors, contact and noncontact type,
Smart sensors and emerging trends:- measurement techniques, Interface electronics and measurement for smart sensor systems, Sensing elements and their parasitic effects.

Optical sensors:PMT, Photodiodes, CCD, LDR, Advanced sensors*:* Optical fiber sensors fortemperature, image, displacement, pressure, flow, and liquid level sensors, biosensors andsmart sensors

Control System Components Design: Control valve and their selection,Pumps,Motors, Transmission schemes, Design of Control panel, Design of Control room layout, Flameproof design, Testing. Design of temperature, pressure, flow, level, humidity, acceleration, vibration, density,volume,weightInstrumentation.

II. SIGNAL CONDITIONING

Basicamplifier configurations and applications:-Inverting and non-inverting amplifier, summingamplifier, subtractoretc.Single ended and differential signals, instrumentation amplifiers, precision rectifiers, activefilters, Log - antilog amplifiers, peak detector, differentiator, integrator, Schmitt trigger waveshaping circuits, liberalization circuits, mili-volt to current converter, F to V and V to Fconversion, phase lock loop etc. problems on analysis and designing, AC carrier systems,phase sensitive Modulator, Demodulator, Chopper stabilized Amplifier.

Analog to digital converters, Digital to analogconverters.

III. EMBEDDED INSTRUMENTATION

Microprocessor Support Devices: Memories:interfacing of memory devices with microprocessor / microcontroller. Memory mapping scheme, Input output devices, Programmable peripheral interface 8255, Programmable timer counter 8253, Keyboard and Display interface device 8279, study and interfacing techniques for 8051.

Modular Development of Embedded System: Interfacing of switches and LEDs, Rotary switches and related programming, interfacing of matrix type keyboard, lookup table searching, Error detection programs, Interfacing of seven segment displays and alpha numeric LCD modules, Interfacing of ADC and DAC, I / O Expansion for 8051 using serial interface, Timers and counters in 8051, various modes of operation, generation of PWM signal, Interrupts in 8051, priority of interrupts, vectored interrupts Implementation and applications of serial interface RS 232 using 8051 UART, Study of Parallel Interface, extensive programming exercises using assembly and C language.

IV. PROCESS CONTROL AND ADVANCED CONTROL

Discontinuous and continuous controllersand types, control system configuration, single variable, multi variable,cascade controllers, feedback and feed forward controller.

Discrete State Process Control: Discrete state system characteristics, process specifications,sequential control, Programmable Logic Controllers Data logging, Supervisory controllers, Factoryautomation.

Design and Applications of Advanced Control Concepts: Process modeling and identification, Adaptive Control and Self Tuning, Feedforward Control, Cascade Control, Multivariable Control Systems, Model Predictive control.

Design of Digital Controllers: Digital approximation of classical controllers, Effect of sampling, Different class of digital controllers, Ringing and placement of poles, Design of optimal regulatory control systems, General synthesis method, Dahlin design, Kalman design, Predictive controller design, Internal-Model control.

Model Reference Adaptive System.

Self Tuning Regulators, Recursive Parameter Estimation Methods, Connection between MRAS and STR.

V.INSTRUMENTATION HARDWARE

PC add on cards: Different bus architectures on PC motherboard for add on card / prototype functions i.e. PCI, PCI express bus, Control through PC add on card, Data acquisition concept by study of AD / DA card, Introduction to digital input output card, Timer card, Frame grabber card, Ethernet card.

PC Communication Ports: Introduction to CENTRONICS parallel port, Serial COM1 / COM2 ports, RS232 standard, USB communication, Importance of GPIB / IEEE488 interface for PC based instrumentation for scientific applications.

VI. INDUSTRIAL AUTOMATION

Different types of processes. Typical examples of continuous, batch, discrete and hybrid processes. Study of Process flow, detailed P&ID, Critical loops, Safety and Alarms, Reliability and Fail-safe operation requirements, efficient running and adhering to standards. Role of automation in industries, Benefits of automation.

Distributed Control Systems (DCS)

Process field instrument and communication- HART, Foundation fieldbus, Profibus protocol introduction, frame structure, programming, implementation examples, Benefits, Advantages and Limitations. Comparison with other field bus standards including device net, Profibus, Controlnet, CAN, Industrial Ethernet etc.

Soft computing techniques - Neural network, fuzzy logic ANFIS, Genetic algorithm etc.

VII. BIOMEDICAL SIGNAL PROCESSING

Fundamentals of signal and system**DSP:-**background and review discrete time random signals.Quantization effects**. Multirate Digital Signal Processing:**Fundamentals of Multirate systems, Basic multirate operations, Decimation, interpolation, filter design and implementation of sampling rate conversion, polyphase filter structures, time variant filter, structures, multistage implementation of sampling rate conversion of BP signals, sampling rate conversion by an arbitrary factor, interconnection of building blocks, polyphase representation, multistage implementations.

Wavelet Transform: Introduction to wavelets, wavelets and wavelet expansion systems, discrete wavelet transform, multiresolution formulation of wavelet systems, Wavelet and other wavelet representations, scaling function, wavelet functions, Parseval's theorem.

Biomedical Signal Processingand analysisAcquisition, Generation of Bio-signals, Study of diagnostically significant bio-signal parameters Electrodes for bio-physiological sensing and conditioning, Electrode-electrolyte interface, polarization, Acquisition of bio-signals (signal conditioning) and Signal conversion (ADC’s DAC’s) Processing, Digital filtering, Biomedical signal processing by Fourier analysis, Biomedical signal processing by wavelet (time-frequency) analysis.

Textile Engineering
Research Methodology
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Textile Structures
Fibre structure and morphology and their effect on fibre properties, Tensile properties of fibres, Theories of mechanical properties, mechanism of Heat setting of fibres, different yarn structures and their characteristics, geometry of twisted yarns, Float and weave value, warp & weft crimp, density of cloth, cover factor, elements of fabric geometry, cloth setting theories, plain and matt weaves.

Textile Testing

Principle and measurement of fibre, yarn and fabric properties:

Fibre length, fineness, strength, friction, moisture regain, maturity, trash content; High Volume Instrument (HVI) and AFIS equipment, Yarn count, twist, crimp and hairiness, fabric thickness, Tear strength, Bursting strength, Abrasion resistance, Fabric handle, drape and stiffness, Crease resistance and crease recovery, Air permeability, Water repellence and permeability, flammability testing, Tensile behaviour of textiles- fibre, yarn and fabric, Concepts of CRT, CRE and CRL principles, Kawabata (KES) and FAST systems, Principle of measurement of various parameters

Yarn Manufacture

Opening and cleaning: Evolution of opening and cleaning process. Critical design aspects and principles of modern blowroom machinery.

Carding: Basic theories of carding. Conditions of fibre transfer. Transfer efficiency and quality. Design aspects in different zones of modern card.

Drafting: Theories of drafting.Drafting force. Causes for irregularity in drafted strand.Auto levelling. Design significance of modern draw frames.

Combing: Importance ofcombing preparation. Fibre fractionation at comber. design aspects in modern comber.

Speed frame: Design aspects and principles of modern speed frame machines and process.

Ring Frame: Design developments in various components of ring frame. Spinning geometry and Twist Flow. Development of compact spinning.

Fibre Blending: Methods of blending and analysis. Blend intimacy and measures of blend variation, Significance of developments in blending techniques and machines.

Rotor spinning: Technical developments in rotor spinning machine, developments in rotor drives. Automation in rotor spinning machines. Structure and properties of yarn produced.

Air jet spinning: Technical developments in air jet spinning. Structure and properties of air jet spun yarns, Vortex spinning.

Friction Spinning: Technical developments in friction spinning structure & properties of friction spun yarn.

Texturizing: Evaluation of different texturizing system. Factors influencing the properties of false twist & air textured yarns.

Fabric Manufacture

Winding: Technological significance in the design development of automatic winding machine. Influence of winding process on yarn quality and Package build.

Warping: Technological significance in the design developments of beam and sectional warping machine. Influence of warping process on yarn quality and beam build.

Sizing: Technological significance in the design development of sizing machine. Automation in sizing process.

Weaving: Theory of weft insertion by projectiles, developments in projectile weaving machines. Theory of weft insertion by rapiers, developments in rapier heads, positive, rapiers, developments in rapier drives, developments in rapier weaving. Theory of weft insertion in air and water jet picking, developments in machine design, nozzles. Design developments in high speed shedding devices, cam, dobby and jacquard motions, developments in cam beat-up.Developments in warp let off and take-up motions, motorized electronic take-up & let off.Control systems – weft feeders, warp & weft monitor systems, selvedge, colour control, lubrication clearing, drive, intelligent monitoring system. Yarn quality and preparation requirements for high speed weaving.

Non-woven: Characteristics of needle punched, adhesive bended, thermal bonded & spun bended non-wovens, process variables and their effect on structure & proportion of non-wovens. Developments in non-woven machines.

Knitting: Design, functional and constructional aspects of different zones of circular knitting machines. Effect of machine and material parameters on fabric quality. Geometrical aspects of knitting fabrics.Developments in knitting machines.

Technical Textiles: High–performance and high- functional fibres and textiles, Filter fabrics: Mechanics of filtration, Different filtration processes and textiles, Thermal,

chemical clothing, and mechanical protective clothing, Automotive Textiles: Major fibres, fabric types, formation and properties, building of seat, seat belt, carpet, air-bags etc., Tyre cord, Coated fabrics: introduction, different coating materials, different coating methods, U-V Cured coating, Geotextiles: Functions, raw material, application of geotextiles for drainage, stabilization, filtration, erosion control and reinforcement, Medical textiles and sports textiles.

Textile Processing

Chemistry and technology of different desizing viz. Enzymatic, acid and oxidative, Scouring and bleaching, Mercerisation, Colour, Spectrophotometer, Theory of dyeing, Mechanisms of dissolution, absorption and fixation of different dyes, Principle of working of different dyeing machine like jigger, yarn dyeing machine, padding mangle, HTHP beam dyeing machine, Jet dyeing machine, Dope dyeing.Dyeing of synthetics like viscose rayon, polyester, polyamide, acrylonitrile fabrics with suitable dyes, Natural dyes, Printing of cellulosics with reactive and vat, Printing with disperse, acid and cationic dyes, Printing with pigments. Working of flat bed and rotary screen printing, Transfer printing, ageing and steaming in printing, Finishing of textiles, Temporary & Permanent, Heat setting and calendaring, Coating of textiles.

Apparel Technology

Pattern Engineering and Draping. Dart Manipulation - basic techniques, Applications of dart manipulation Pattern Alteration. Layout Planning. Grading - manual grading and computerized grading.

Production Systems - Section production systems, UNIT production system, Production scheduling, Network representations. Spreading Machine - Features and Technical Specifications of Spreading machines. Automatic Cutting Machine. Sewing Machine. Special Machines – Button holing, Button fixing, Flat lock, Chain lock, Over lock. Embroidery Sewing machine- Special features and attachments Pressing Machine Computer Integrated Manufacturing. 3D scanning Technique.CAD/CAM in Garment Manufacturing.

Environmental Engineering

Sr. No.	Paper	Subject	Weightage
1	**Paper I**	Environmental Engineering	50 Marks
2	**Paper II**	Research Methodology	50 Marks

Paper I

Unit I

Physico-Chemical Processes For Water And Wastewater Treatment:

Aeration in water and wastewater treatment, Gas-liquid mass transfer, two film theory, Types of aerator Coagulation theory, Flocculation, Orthokinetic and perikinetic, Design of slow and rapid mixers. Sedimentation, particle settling theory, types of settling and related theory, types of clarifier, high rate clarification, design of clarifiers. Introduction to depth filtration, filtration processes, principal mechanisms of filtration, filter hydraulics, backwash hydraulics. Adsorption processes, causes and types of adsorption, adsorption isotherms. Removal of dissolved solids: Ion exchange, Membrane processes.

Disinfection, modes of disinfection, mechanisms, factors influencing, ideal disinfectant, chemistry of chlorination, Corrosion, types of corrosion, methods of corrosion control.

Unit II

Biological Wastewater Treatment:

Objectives and fundamentals of biological treatment, types of biological treatment processes. Conventional activated sludge process, process kinetics and design considerations, process control measures, operational problems, Introduction to modifications. Trickling filter, classification, process design considerations. Fundamentals of anaerobic treatment, general design considerations, types of anaerobic reactors.

Unit III

Air & Noise Pollution Control:

Physics of atmosphere, Lapse rate, Inversion, Stability conditions, Plume behavior. Definitions of different particulate matter, Distribution and source of SPM. General control of suspended and Gaseous pollutants. Noise Pollution, Decibel scales, Noise characteristics & measurement, Levels of noise and standards, Control measures of community and industrial noise.

Unit IV

Industrial Wastewater Treatment:

Effects of Industrial Wastes, Effluent standards and stream standards. Industrial Waste survey. Material balance, Sampling, Bio monitoring. Pretreatment of Industrial Wastewater- Wastewater Treatment in industries, Ultimate disposal of Industrial Wastewater, effects of waste additions on physical and chemical properties of soil, Design of complete treatment system, Environmental Auditing, Financial and Managerial opportunities.

Unit V

Solid Waste Management:

Solid waste: Types, sources, characteristics, Functional elements of Soild waste management, Processing and disposal techniques. Factors Affecting the Solid Waste Generation, Composition and Characteristics of Solid Waste; Collection of Solid Waste: Methods of Collection, Layout of Collection Route, Door Step Collection Arrangement from Bulk Garbage Generators; Transportation of Solid Waste: Transfer Stations, Segregation of Solid Waste, Methods of Segregation.

References:

- Chemistry for Environmental Engineers", Sawyer and McCarty
- Theory and Practice of water and Wastewater treatment – Ronald Droste.
- Environmental Engineering – Peavy, Rowe and Tchnologous.
- Physico-chemical processes of water purification – Weber
- Wastewater Engineering treatment and reuse– Metcalf Eddy.
- "Air Pollution", Wark and Warner.
- "Air Pollution Vol. I and II", Stern.
- Environmental Impact Assessment – Canter
- Integrated solid waste management – George Tchobanoglous.
- Solid waste management – A. D. Bhide.
- Nemerow N.N., (1971) – "Liquid Waste of industry theories, "Practices and Treatment. Addison Willey New York.
- Ross R.D. (1968)– "Industrial Waste Disposal", Reinhold Environmental Series – New York.
- New Delhi American Chemical Society, Washington D.C. USA
- Crawford Martin, "Air pollution control theory", Tata McGraw- Hill publishing company Ltd. New Delhi, 1980.
- Wark K., Warner C.F., and Davis. W.T., Air Pollution,(1998) "its origin and control", Third Edition, Harper and Row Publication.
- Environment Impact Assessment – Larry W. Canter – McGraw Hill Publication.
- Water and Wastewater Engineering Vol-II:- Fair, Geyer and Okun : John Willey Publishers, New York.
- Waste Water Treatment, Disposal and Reuse: Metcalf and Eddy inc: Tata McGraw Hill Publications.

COMPUTER SCIENCE AND ENGINEERING

Research Methodology

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Business Research Methods – Alan Bryman& Emma Bell, Oxford University Press.

Section II(Subject specific Syllabus)

Remaining 50% shall be based on Subject Specific as mentioned below

I. Theory of Computation:

Mathematical notions and terminology of sets, sequences and tuples, functions and relations, graphs, strings and languages. Boolean logic properties and representation. Definition, Theorems and types of proofs, formal proofs, deductive, reduction to definition, proof by construction, contradiction, induction and counter examples.
Turing machines, variants of TMs, programming techniques for TMs, TMs and computers. Decidable languages, decidable problems concerning Context-free languages.

Text Books:

1. Introduction to Theory of Computation - Michael Sipser (Thomson Brools Cole)
2. Introduction to Automata Theory, Languages and Computation - J. E. Hoperoft, Rajeev Motawani and J.D. Ullman (Pearson Education Asia) 2nd Edition.

II. Advanced Operating System

Distributed computing systems fundamentals : Distributed computing system. Design issues of Distributed operating system. Distributed computing environment.

Message Passing: Features of a good Message Passing System. Issues in IPC by Message Passing Synchronization, Bullering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure handling, Group Communication.

Communication in Distributed Systems: RPC Model, Implementing RPC Mechanism. Stub Generation. RPC Messages, Marshaling Arguments and Results. Server Management, Parameter-Passing semantics, call semantics, Communication protocols for RPCs, Client-Server Building, Exception handling, Security, RPC in Heterogeneous Environments, Lightweight RPC.

Distributed Shared Memory: General Architecture of DSM systems. Design and implementation Issues of DSM, Granularity, Structure of Shared Memory Space. Consistency models, Replacement strategy, Thrashing.

Text book:

1. Distributed Operating Systems concepts and design-P.K.Sinha(PHI).
2. Modern Operating System-Singhal

III. Data structures and Algorithms

Introduction : Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs, asymptotic notations, Average, Best and Worst case analysis of algorithm for

Time and Space complexity, Amortized Analysis, Solving Recurrence Equations

Greedy method and Dynamic Programming :

General methods, Job sequencing with deadlines, Minimum cost spanning trees, Optimal merge patterns, All pairs shortest paths, Optimal binary search trees,Travelling salesman problem and flow shop scheduling

Backtracking and Branch and Bound:

Backtracking : General Strategy, 8 Queen‘s problem, Graph Colouring, Hamiltonian Cycles,

0/1 Knapsack.

Branch and Bound : General Strategy, 0/1 Knapsack, Traveling Salesperson Problem.

Text Books

1. Ellis Horowitz, Sartaj Sahni , ―Fundamental of Computer Algorithms

IV. Advanced Database Concepts

Distributed database management system:

Features of DDS, Distribution transparency, DDB design, Query translation, Optimization

Distributed Transaction:

Management of distributed transaction, concurrency control, reliability.

Parallel Databases :

I/O parallelism, Inter-query and Intra query parallelism, Intra operation and Interoperation parallelism

Object database management system:

Overview, Complex Data types, Structured data types, Encapsulation Inheritance, Arrays and Multiset types in SQL, Object OIDs and reference types, ORDBMS, Object Query Language

Multimedia database system:
Multimedia database management system, image and text database techniques, Audio and Video Database Techniques Physical Storage and Retrieval. Data structure, Operation, indexing, segmentation.
Spatial and Temporal Database:
Types of spatial data and queries, spatial indices: Space filling curves grid files, R-Trees, Introduction to temporal data, Time in databases.
Data Mining techniques:
Data mining algorithms, classification, Decision- Tree based Classifiers clustering, association Association-Rule Mining Information Extraction using Neural Networks. Knowledge discovery, KDD environment

Text Books
1. Database management system - Ramakrishna Gherkin (McGraw Hill)
2. Distributed Database Principals and systems - Stephan ceri, Giuseppe Pelagatti. (McGraw Hill)
3. Database system concepts - Silberschatz, Korth, Sudershan, McGraw Hill International
4. Paulraj Ponniah, ―Web warehousing fundamentals‖ – John Wiley.
5. M. H. Dunham, ―Data mining introductory and advanced topics‖ – Pearson education

V.Web Technology

Introduction : HTML 4 protocols – HTTP, SMTP, POP3, MIME, IMAP. Introduction to JAVA Scripts – Object Based Scripting for the web. Structures – Functions, Arrays– Objects.
Dynamic HTML:
Introduction – Object refers, Collectors all and Children. Dynamic style, Dynamic position, frames, navigator, Event Model – On check – On load – Onenor – Mouse rel – Form process – Event Bubblers – Filters – Creating Images – Adding shadows – Data Binding – Simple Data Binding –Moving with a record set – Sorting table data – Binding of an Image and table.
Multimedia:
Audio and video speech synthesis and recognition - Electronic Commerce – E-Business Model – E- Marketing – Online Payments and Security – Web Servers – HTTP request types– System Architecture – Client Side Scripting and Server side Scripting – Accessing Web servers – IIS – Apache web server.
DATABASE- ASP – XML:
Database, Relational Database model – Overview, SQL – ASP – Working of ASP – Objects– File System Objects – Session tracking and cookies – ADO – Access a Database from ASP– Server side Active-X Components.

Servlets and JSP:
Introduction – Servlet Overview Architecture – Handling HTTP Request – Get and post request – redirecting request – multi-tier applications – JSP – Overview – Objects – scripting– Standard Actions–Directives.
Web Architectures:
Web architectures, web analysis, web restructuring methodologies, Web 2.0, Web 3.0 concepts and implementation strategies.
Web security:
Web insecurity Security strategies, General security, Listing of server-side risks, Language specific security

Text Book :

1. Deitel & Deitel, Goldberg, ―Internet and world wide web – How to Program‖, Pearson
Education Asia, 2001.

2. Eric Ladd, Jim O‘ Donnel, ―Using HTML 4, XML and JAVA‖, Prentice Hall of India
- QUE, 1999.

VI.Advanced Computer Networks

Why IPv6: The Structure of the IPv6 Protocol: General Header Structure, the Fields in the IPv6 Header, Extension Headers. IPv6 Addressing: The IPv6 Address Space, Address Types, Address
Notation, Prefix Notation, Global Routing Prefixes, Global Unicast Address, Special Addresses,
Link- and Site-Local Addresses, Any-cast Addresses, Multicast Address, Required Addresses,
Default Address Selection.
Interoperability: Dual-Stack Techniques, Tunneling Techniques, Network Address and Protocol
Translation, Comparison, ICMPv6: General Message Format, ICMP Error Messages, ICMP
Informational Messages, Processing Rules, The ICMPv6 Header in a Trace File, Neighbor
Discovery (ND), Autoconfiguration, Network Renumbering, Path MTU Discovery, Multicast
Listener Discovery (MLD), Multicast Router Discovery (MRD).
Networking Aspects: Layer 2 Support for IPv6, Detecting Network Attachment (DNA). Routing
Protocols: The Routing Table, RIPng, OSPF for IPv6 (OSPFv3), BGP-4 Support for IPv6.
Upper-Layer Protocols: UDP/TCP, DHCP, DNS, SLP, FTP, Telnet, Web Servers
IPv6 Quality of Service: QoS Basics, QoS in IPv6 Protocols, Using QoS
Network Services and Layered Architectures**:** Applications, Traffic Characterization and Quality of Service, Network Services, High -Performance Networks, Network Elements, Basic
Network Mechanisms, Network Elements, Basic Network Mechanisms, Layered Architecture,
Open Data Network Model, Network Architectures.

Text Books:

1. IPv6 Essentials, 2nd Edition by Silvia Hagen, O’ Reilly Publications. ISBN: 0-596-10058-2.
2. Walrand.J. Varaiya, High Performance Communication Network, Morgan Kauffman - Harcourt Asia Pvt Ltd, 2nd Edition, 2000. ISBN: 1-55860-654-8

VII.PARALLEL COMPUTER ARCHITECTURE

PARALLEL MODELS:
Parallel computer models: Multiprocessors and Multicomputer – Multivector and SIMD computer
PRAM & VLSI models, conditions of parallelism. System interconnect architectures performance.
Metrics and Measures.
PROCESSORS AND MEMORY HIERARCHY:
Advanced processor technology – Super scalar and vector processors – Memory hierarchy
technology, virtual memory technology – cache memory organization – shared – memory organization.
PIPELINING AND SUPERSCALAR TECHNIQUES :

Linear pipeline processors – Nonlinear pipeline processors – Instruction pipeline design Arithmetic
pipeline design – Superscalar pipeline design
PARALLEL AND SCALABLE ARCHITECTURE:
Multiprocessor system interconnects – Cache coherence, Vector processing principle
Compound Vector processing, SIMD computer organization, multiprocessor operating system,
multiprocessor examples
SCALABLE, MULTITHREADED & DATA FLOW ARCHITECTURE :
Latency – Hiding techniques – Principles of Multithreading , Scalable and Multithreaded architectures. Dataflow computer, static data flow computer , Dynamic data flow compiler

Text Book
1. Kai Hwang, "Advanced Computer Architecture", Parallelism, Scalability, Programmability, McGraw Hill, 1993

CIVIL ENGINEERING
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BOOKS RECOMMENDED:
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Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
Business Research Methods – Alan Bryman& Emma Bell, Oxford University Press.

Section II(Subject specific Syllabus)

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Unit 1: Engineering Mathematics

Linear Algebra: Matrix algebra, Systems of linear equations, Eigen values and eigenvectors.

Probability and Statistics: Definitions of probability, Conditional probability, Mean, median, mode and standard deviation, Random variables, Poisson, Normal and Binomial distributions.

Numerical Methods: Numerical solutions of linear and non-linear algebraic equations Integration by trapezoidal and Simpson′s rule

Unit 2: Structural Engineering

Solid Mechanics: System of forces, stress-strain relationship. Theory of shear force and bending moment. Impulse momentum priciple, priciple of virtual work, Thin walled pressure vessels, uniform torsion, buckling of column, combined and direct bending stresses.

Structural Analysis: Analysis of statically determinate trusses, arches, beams, cables and frames, displacements in statically determinate structures and analysis of statically indeterminate structures by force/ energy methods, analysis by displacement methods, influence lines for determinate and indeterminate structures. Basic concepts of matrix methods of structural analysis.

Concrete Structures: Concrete Technology- properties of concrete, basics of mix design. Concrete design- basic working stress and limit state design concepts, analysis of ultimate load capacity and design of members subjected to flexure, shear, compression and torsion by limit state methods. Basic elements of prestressed concrete, analysis of beam sections at transfer and service loads.

Steel Structures: Analysis and design of tension and compression members, beams and beamcolumns, column bases. Connections- simple and eccentric, beam–column connections, plate girders and trusses. Plastic analysis of beams and frames.

Unit 3: Geotechnical Engineering

Soil Mechanics: IS Soil classification and index properties, permeability & seepage, effective stress principle, compaction and consolidation, Mohr’s circle and shear strength.

Foundation Engineering: Soil exploration. Earth pressure theories. Stability of slopes. Foundation design requirements. Shallow foundations-bearing capacity, stress distribution, settlement analysis in sands & clays. Deep foundations- pile types, dynamic & static formulae, load capacity of piles in sands & clays.

Unit 4: Hydraulics Engineering

Fluid Mechanics and Hydraulics: Principle of conservation of mass, momentum, energy and corresponding equations, flow in pipes, open channel flow, flow measurements in channels, tanks and pipes. Dimensional analysis and hydraulic modeling, Boundary layer theory, Forces on immersed bodies, Fluid machinery, velocity triangles and specific speed of pumps and turbines.

Hydrology: Hydrologic cycle, unit hydrograph theory, design flood estimation, reservoir planning, reservoir and channel routing. Well hydraulics.

Irrigation: Soil-water plant relationship. Types of irrigation system/ methods, design of hydraulic structures and canal regulatory works.

Unit 5: Construction Materials and Management

Advanced construction materials and their properties, Classification of construction projects & project development process, Project Planning, CPM, PERT, Resource leveling, Project feasibility analysis, Material management and inventory control, Project management information system, , Tendering and construction contracts; Rate analysis and standard specifications; Cost estimation.

Unit 6: Environmental Science and Engineering

Fundamentals of Ecology, Ecosystem and Environment. Air Pollution & Control, Meteorology, Water Supply and water treatment and Waste water techniques, Sanitation systems, Noise pollution and control measures and standards, Solid waste management, rules and regulations, MoEF standards, Environmental Impact Assessment, EIA notifications, Disaster management, Climate and Climatology, Remote sensing and GIS, Forestry, Wildlife protection, Global and national issues of environment, resource scarcity, energy. Design of pollution management facilities.International protocols.

Unit 7: Transportation Engineering

Urban and Rural infrastructure system and processes, Traffic planning theory ,Traffic control and management, land use and transport planning models, mass transport planning and design. Highway alignment & Geometric design, Pavement design.

ARCHITECTURE ENGINEERING

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PART-B

1. Architectural history, heritage and conservation –

1.1 Architectural history of Indian sub-continent,

1.2 regional architecture of India,

1.3 modern movement,

1.4 Contemporary architecture across the world.

1.5 Steps in architectural conservation.

2 Site Planning, Landscape and Urban & Rural Planning –

2.2 Principles of landscape design and site planning,

2.3 landscape elements and materials,

2.4 environmental considerations in landscape Planning.

2.5 Significance of urban design,

2.6 process of urban design,

2.7 universal design

2.8 Principles & environmental considerations of Urban Design

2.9 Inclusive Planning

3. Building sciences and construction –

3.1 Climatic considerations,

3.2 building climatology,

3.3 indoor environmental qualities,

3.4 modular coordination,

3.5 construction techniques and materials,

3.6 Building services – drainage and water supply at site level and city level, acoustics, firefighting, natural and mechanical ventilation, lighting and illumination.

4. Professional Practice –

4.1 Building byelaws,

4.2 national building code,

4.3 quantity surveying and estimation,

4.4 tendering, architects' act,1972

4.5 office management.

4.6 Project Management – PERT, CPM, Supply chain management, quality control, safety issues on sites.

5. ENVIRONMENTAL ARCHITECTURE:

5.1 Man-Environment relationship – Resource depletion, pollution, resource management, bio-geochemical cycles, urban ecology, global warming, climate change, urban environmental issues, solid waste management, water conservation.

5.2 Energy efficiency and Green Building Technology – Norms, standards, rating and evaluation.

6. HOUSING & DISASTER MANAGEMENT

6.1 Real Estate Law

6.2 Housing Typology, National Hosing policy, Affordable Housing, Public Housing

6.3 Natural and manmade disasters, disaster risk management, planning and design responses.

CHEMICAL ENGINEERING

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Boundary Layer Flow: Boundary layer equations, separation of BL, Blasius solution for flat state, properties of BL equation, Similarity solutions, Momentum integral equations.

Agitation And Mixing: Agitation of liquids, Mixing mechanisms (Laminar mixing, Turbulent mixing), Circulation, Velocities in stirred tanks. Flow patterns in stirred tanks, Power consumptions in stirred vessels, mixing equipments.

Turbulent Flow: Reynolds equation for turbulent flow, velocity distribution for flow in pipe. Statistical theory of turbulence. Effect of wall roughness, drag reduction etc.

Non-Newtonian Fluids: Rheological behavior of non-Newtonian fluids, laminar flow in cylindrical tubes, laminar flow between parallel plates, laminar flow in annuli. Generalized relationship for power law model.

Introduction: Brief Introduction to different modes of heat transfer; Conduction: General heat conduction Equation-Initial and Boundary conditions, Steady State Heat Transfer, Transient heat conduction; Lumped system analysis, heat transfer analogies, heat transfer to liquid metals.

Turbulent Forced Convective Heat Transfer: Momentum and energy equations – turbulent boundary layer heat transfer – mixing length concept - turbulence model, Heat pipe

Detailed review of thermodynamics laws and basic concepts : Concepts of entropy, Specifications of the equilibrium state, Intensive and extensive variables, Equations of state, Enthalpy, Gibbs free energy and other important thermodynamic properties.

Introduction to dynamic models: Mass balance equation - Balancing procedure, Case studies: CSTR, Tubular reactor, Coffee percolator, Total mass balance – Case Studies: Tank drainage, Component balances - Case Studies: Waste holding tank, Energy balance- Heating in a filling tank, Parallel reaction in a semi continuous reactor with large temperature difference, Momentum balances – Dimensionless model equations, CSTR, Gas liquid mass transfer in a continuous reactor**.**

Introduction to Nanotechnology: History, Importance of Nanoscales, Fundamental concepts(Bottom-up and Top-down processes).

Introduction to Green Chemistry: Principles of Green Chemistry, Reasons for Green Chemistry (resource minimisation, waste minimisation, concepts), Green reactions solvent free reactions, Catalyzed (heterogeneous/homogeneous) reactions, MW/ Ultrasound mediated reactions, Bio catalysts etc

Drug Development in Pharmaceutical Process- Production of pharmaceuticals by genetically engineered cells (hormones, interferrons) - Microbial transformation for production of important pharmaceuticals (steroids and semi-synthetic antibiotics)

Review of fundamentals of microbiology and biochemistry. Bioprocess principles: Kinetics of biomass production. Substrate utilization and product formation.

Shell and Tube Heat exchanger: Classification, Shell and Tube side Heat Transfer Coefficients, Pressure drop, Fouling, Baffles, Passes Tubes Tube Sheet, Effectiveness, of Heat exchanger, Heat Exchangers sizing For Heating or Cooling in agitated vessel, Heat exchangers and their Suitability, Jacketed Batch Reactor Heating, Air Cooled Heat exchanger, optimum Cooling water Temp, Mechanical Design Of Shell and Tube Heat exchanger, Differential Expansions and Thermal Stress in Heat exchanger.

Physical-Chemical Phenomena: Diffusivity and mechanism, Diffusion dispersion, Diffusivity measurements and prediction in non- electrolytes and electrolytes, solubility of gases in liquids, Interphase mass transfer in two phase and multi component system.

Mass transfer with Chemical reaction: Fluid-fluid reactions involving diffusion transfer, application of mass transfer to reacting systems Residence time distribution analysis, mass transfer coefficients, determination and prediction in dispersed multiphase contractors under the conditions of free forced convection, prediction of mean drop or bubble size of dispersion.

Chemical kinetics and Ideal reactor .
Heterogeneous reaction: Classification, Rate Controlling step, globale rate of reaction
Non Ideal flow and mixing: Mixing concept, RTD, Response measurement, segregated flow model, Dispersion model, Tank in Series model, recycle rector model, analysis non ideal reactor

Introduction To Feed Back Control: Concept of feedback Control, Types of feedback Controllers, Measuring Devises, Transmission Lines, Final Control Elements.

Dynamic Behavior Of Feedback Control System: Block Diagram and closed looped response, effect of P Control, I Control, D Control, and Composite Control Action on response of a controlled process.

Filtration
Process Concept, Theory and Equipment used in Cross flow filtration , Cross flow electro filtration, duel functional filtration surface based solid- liquid separation involving stead liquid , Sirofloc filter.

Membrane filtration
Types and choice of membranes, Plates and frame, tubular, Spherial wounded and hollow fibre membrane, reactor and their relative merits , commercial, pilot plant, and labortary membranes, Permeates involving analysis, reverse osmosis, nano filtration, ultrafiltration, microfiltration and donan analysis, economics of membrane operation, cevanic membrane.

Biomass Removal and Disruption: Biomass removal and disruption: Cell disruption by Mechanical and non mechanical methods, Chemical lysis, Enzymatic lysis, physical methods, Sonication, Types of Homogenizers, Centrifugation; Sedimentation; Flocculation.

SHIVAJI UNIVERSITY, KOLHAPUR

M. Phil & Ph. D. Entrance Syllabus

Implemented from 2017-18

Important Note: Nature of Question Paper, Standard of passing & other rules shall be applicable as per new M.Phil. /Ph.D. Prospectus for the Academic Year: 2017-18.

All Commerce, Management Subjects

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Research Methodology

Section-I

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

Unit-III Research Design-

Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design.

Unit-IV Collection and Analysis of Data:

Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation.

Unit-V Presentation of Research:

Citation Styles- APA, MLA etc., Research ethics and Plagiarism, Report writing-steps in report writing, layout of report writing, reference and bibliography.

Reference Books:

1) George J. (1964), The Science of Education Research, Eurasia Publishing House, New Delhi

2) William Philip at. Al (1973), Evaluation and Assessment of educational Studies: A third level course methods of educational enquiry, The Open University Press, Walton Hall Blethaley Buckinghamshire

3) Mariampolski H. (2001) Qualitative Market Research – A Comprehensive Guide Sage Publication, India Ltd, New Delhi

4) Black Thomas (2001), Understanding Social Science Research, Sage Publication, India Ltd, New Delhi

5) Fern Edward F.(2001) Advanced focus Group Research, Sage Publication, India Ltd, New Delhi

6) Michael V.P., 'Research Methodology in Management', Himalaya Publishing House, New Delhi.

7) Krishnaswami O.R. and Ranganatham M., 'Methodology of Research in Social Sciences', Himalaya Publishing House, New Delhi.

8) Kothari C.R., 'Research Methodology – Methods and Techniques', New Age International Publishers

9) Pauline V. Young, 'Scientific Social Surveys and Research', Prentice-Hall of Indian Pvt. Ltd., New Delhi.

10) Sachdeva J.K., Business Research Methodology, Himalaya Publishing House, 2nd revised, 2011.

11) Sadhu and Singh, Research Methodology in Social Sciences, Himalaya Publishing House, Mumbai.

12) Wilkinson and Bhandarkar (2002), Methodology and Techniques of Social Research.

13) Barker, Nancy and Nancy Hulig (2000), A Research Guide for Under Graduate Students: English and American Literature, New York: Norton

14) Miller, R. H. (1995), Handbook of Library Research, Meghuen.

15) Rengachari, S. & Rengachari, Sulochana, Research Methodology for English Literaure, Bareilly

16) Sinha, M. P., Research Methods in English.

Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

SHIVAJI UNIVERSITY, KOLHAPUR

M. Phil & Ph. D. Entrance Syllabus

Implemented from 2017

(Subject - Political Science)

Important Note : Nature of Question Paper, Standard of passing & other rules shall be applicable as per new M.Phil./Ph.D. Prospectus for the Academic Year : 2017-18.

Section - I

Research Methodology

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

Unit-III Research Design-

Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design.

Unit-IV Collection and Analysis of Data:

Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation.

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16) Sinha, M. P., Research Methods in English.

Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

विभाग – 2

उर्वरित Subject Specific साठी त्या–त्या विषयाच्या पदव्युत्तर अभ्यासक्रमातील आवश्यक(Compulsory) पेपरचा संपूर्ण अभ्यासक्रम राहील.

SHIVAJI UNIVERSITY, KOLHAPUR

M. Phil & Ph. D. Entrance Syllabus

Implemented from 2017

(Subject - Sociology)

Important Note : Nature of Question Paper, Standard of passing & other rules shall be applicable as per new M.Phil./Ph.D. Prospectus for the Academic Year : 2017-18.

Section - I

Research Methodology

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

Unit-III Research Design-

Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design.

Unit-IV Collection and Analysis of Data:

Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation.

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16) Sinha, M. P., Research Methods in English.

Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

विभाग – 2

उर्वरित Subject Specific साठी त्या–त्या विषयाच्या पदव्युत्तर अभ्यासक्रमातील आवश्यक(Compulsory) पेपरचा संपूर्ण अभ्यासक्रम राहील.

SHIVAJI UNIVERSITY, KOLHAPUR

M. Phil & Ph. D. Entrance Syllabus

Implemented from 2017

(Subject - History)

Important Note : Nature of Question Paper, Standard of passing & other rules shall be applicable as per new M.Phil./Ph.D. Prospectus for the Academic Year : 2017-18.

Section - I

Research Methodology

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

Unit-III Research Design-

Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design.

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Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation.

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Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

विभाग – 2

उर्वरित Subject Specific साठी त्या–त्या विषयाच्या पदव्युत्तर अभ्यासक्रमातील आवश्यक(Compulsory) पेपरचा संपूर्ण अभ्यासक्रम राहील.

SHIVAJI UNIVERSITY, KOLHAPUR

M. Phil & Ph. D. Entrance Syllabus

Implemented from 2017

(Subject - Economics)

Important Note : Nature of Question Paper, Standard of passing & other rules shall be applicable as per new M.Phil./Ph.D. Prospectus for the Academic Year : 2017-18.

Section - I

Research Methodology

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

Unit-III Research Design-

Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design.

Unit-IV Collection and Analysis of Data:

Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation.

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Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

विभाग – 2

उर्वरित Subject Specific साठी त्या–त्या विषयाच्या पदव्युत्तर अभ्यासक्रमातील आवश्यक(Compulsory) पेपरचा संपूर्ण अभ्यासक्रम राहील.

SHIVAJI UNIVERSITY, KOLHAPUR

M. Phil & Ph. D. Entrance Syllabus

Implemented from 2017

(Subject - Library & Information Science)

Important Note : Nature of Question Paper, Standard of passing & other rules shall be applicable as per new M.Phil./Ph.D. Prospectus for the Academic Year : 2017-18.

Section - I

Research Methodology

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

Unit-III Research Design-

Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design.

Unit-IV Collection and Analysis of Data:

Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation.

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16) Sinha, M. P., Research Methods in English.

Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

विभाग – 2

उर्वरित Subject Specific (**50%**) साठी त्या–त्या विषयाच्या पदव्युत्तर अभ्यासक्रमातील आवश्यक(Compulsory) पेपरचा संपूर्ण अभ्यासक्रम राहील.

SHIVAJI UNIVERSITY, KOLHAPUR

Ph. D. Entrance Syllabus

Implemented from 2017

(Subjects - Social Work)

Important Note: Nature of Question Paper, Standard of passing & other rules shall be applicable as per new M.Phil./Ph.D. Prospectus for the Academic Year : 2017-18.

Section - I

Research Methodology

(50% Part of Entrance Examination for Ph.D. Admission)

Unit-I Fundamentals of research-
Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research, ethics in research. Social work research: Meaning, objectives, functions and limitations scope of social work research in India; agencies sponsoring and conducting social research.

Unit-II Types of Research-
Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc. Action research and intervention.

Unit-III Research Design-
Meaning, Need, Types of research Design-Exploratory Research Design, components of research design and features of good research design.

Unit-IV Collection and Analysis of Data:
Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, PRA and qualitative data Classification and Tabulation, Graphical presentation.

Unit-V Presentation of Research:
Citation Styles- APA, MLA etc., Research ethics and Plagiarism, Report writing- steps in report writing, layout of report writing, reference and bibliography.

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1) George J. (1964), The Science of Education Research, Eurasia Publishing House, New Delhi

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16) Sinha, M. P., Research Methods in English.

17) Rubin, A. and Babbie, K. 1993 *Research Methods for Social Work,* California: Brooks Cole Publishing Co.

Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

विभाग – 2

उर्वरित Subject Specific (**50%**) साठी त्या–त्या विषयाच्या पदव्युत्तर अभ्यासक्रमातील आवश्यक(Compulsory) पेपरचा संपूर्ण अभ्यासक्रम राहील.

SHIVAJI UNIVERSITY, KOLHAPUR

Ph. D. Entrance Syllabus

Implemented from 2017

(Subject - Psychology)

Important Note : Nature of Question Paper, Standard of passing & other rules shall be applicable as per new M.Phil./Ph.D. Prospectus for the Academic Year : 2017-18.

Section - I

Research Methodology

(50% Part of Entrance Examination for Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

Unit-III Research Design-

Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design.

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Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation.

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Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

विभाग – 2

उर्वरित Subject Specific(**50%**) साठी त्या–त्या विषयाच्या पदव्युत्तर अभ्यासक्रमातील आवश्यक(Compulsory) पेपरचा संपूर्ण अभ्यासक्रम राहील.

SHIVAJI UNIVERSITY, KOLHAPUR

Ph. D. Entrance Syllabus

Implemented from 2017

(Subject - Philosophy)

Important Note : Nature of Question Paper, Standard of passing & other rules shall be applicable as per new M.Phil./Ph.D. Prospectus for the Academic Year : 2017-18.

Section - I

Research Methodology

(50% Part of Entrance Examination for Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

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Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

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Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

विभाग – 2

उर्वरित Subject Specific (**50%**) साठी त्या–त्या विषयाच्या पदव्युत्तर अभ्यासक्रमातील आवश्यक(Compulsory) पेपरचा संपूर्ण अभ्यासक्रम राहील.

SHIVAJI UNIVERSITY, KOLHAPUR

English

Research Methodology

Section I

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

Unit-III Research Design-

Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design.

Unit-IV Methods, Collection and Analysis of Data:

Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation.

Unit-V Presentation of Research:

Citation Styles- APA, MLA etc., Research ethics and Plagiarism, Report writing- steps in report writing, layout of report writing, reference and bibliography.

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Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

विभाग – 2

उर्वरित Subject Specific (**50%**) साठी त्या–त्या विषयाच्या पदव्युत्तर अभ्यासक्रमातील आवश्यक(Compulsory) पेपरचा संपूर्ण अभ्यासक्रम राहील.

SHIVAJI UNIVERSITY, KOLHAPUR

Russian

Research Methodology

Section I

(50% Part of Entrance Examination for Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

Unit-III Research Design-

Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design.

Unit-IV Methods, Collection and Analysis of Data:

Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation.

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Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

विभाग – 2

उर्वरित Subject Specific(**50%**) साठी त्या–त्या विषयाच्या पदव्युत्तर अभ्यासक्रमातील आवश्यक(Compulsory) पेपरचा संपूर्ण अभ्यासक्रम राहील.

SHIVAJI UNIVERSITY, KOLHAPUR

Marathi

Research Methodology

Section I

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

Unit-III Research Design-

Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design.

Unit-IV Methods, Collection and Analysis of Data:

Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation.

Physiological (मानसशास्त्रीय), Mythological (आदीबंधात्मक), Phase wise (कालखंडानुसार), Performance Base(प्रयोगजीवी), Pathchikitsa (पाठयचिकित्सा)

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Citation Styles- APA, MLA etc., Research ethics and Plagiarism, Report writing- steps in report writing, layout of report writing, reference and bibliography.

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17) Research Methodology, H. V. Deshpande.

Additional Reference books for Marathi:

1. भाषा व साहित्य संशोधन खंड 1, 2, 3
2. शोधविज्ञान कोश – दु. का. संत
3. साहित्य समीक्षा आणि परिभाषा – वसंत दाववर
4. प्रबंध कसा लिहावा – जयंत वेलणकर
5. संशोधनाची लेखनपध्दती – स. ग. मालशे / मिलिंद मालशे
6. संशोधनाचे पध्दतीशास्त्र – र. मा. वरखेडे
7. शोधनिबंध पध्दती – मिलिंद मालशे

Additional Reference books for Sanskrit:

Elements of Research Methodology - K. C. Das, Chaukhamba Publications, Varanasi.

Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

विभाग – 2

उर्वरित Subject Specific (**50%**) साठी त्या–त्या विषयाच्या पदव्युत्तर अभ्यासक्रमातील आवश्यक(Compulsory) पेपरचा संपूर्ण अभ्यासक्रम राहील.

SHIVAJI UNIVERSITY, KOLHAPUR

Sanskrit

Research Methodology

Section I

(50% Part of Entrance Examination for Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

Unit-III Research Design-

Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design.

Unit-IV Methods, Collection and Analysis of Data:

Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation.

Physiological (मानसशास्त्रीय), Mythological (आदीबंधात्मक), Phase wise (कालखंडानुसार), Performance Base(प्रयोगजीवी), Pathchikitsa (पाठयचिकित्सा)

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Additional Reference books for Sanskrit:

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Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

विभाग – 2

उर्वरित Subject Specific(**50%**) साठी त्या–त्या विषयाच्या पदव्युत्तर अभ्यासक्रमातील आवश्यक(Compulsory) पेपरचा संपूर्ण अभ्यासक्रम राहील.

SHIVAJI UNIVERSITY, KOLHAPUR

Ardhamagadhi

Research Methodology

Section I

(50% Part of Entrance Examination for Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

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Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design.

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Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation.

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Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

विभाग – 2

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SHIVAJI UNIVERSITY, KOLHAPUR

Music and Dramatics

Research Methodology

Section I

(50% Part of Entrance Examination for Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

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विभाग – 2

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SHIVAJI UNIVERSITY, KOLHAPUR

Hindi

Research Methodology

Section I

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

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12) Wilkinson and Bhandarkar (2002), Methodology and Techniques of Social Research.

13) Barker, Nancy and Nancy Hulig (2000), A Research Guide for Under Graduate Students: English and American Literature, New York: Norton

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16) Sinha, M. P., Research Methods in English.
17) Research Methodology, H. V. Deshpande.

Additional Reference books for Hindi:

1. साहित्यिक अनुसंधान के आयाम – डॉ. रविंद्र कुमार जैन
2. शोध प्रनिधी – डॉ. विनय मोहन शर्मा
3. अनुसंधान का स्वरूप – संपा डॉ. सावित्री सिन्हा
4. अनुसंधान की प्रक्रिया – संपा डॉ. सावित्री सिन्हा और डॉ. विजयेंद्र सनातक प्रकाशन – राजकमल प्रकाशन, नागी प्रकाशन, नॅशनल पब्लिशिंग हाऊस, न्यु दिल्ली.

Note:

The question paper of Hindi syllabi shall be translated in Urdu for candidates who are appearing for Urdu medium.

Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

विभाग – 2

उर्वरित Subject Specific(**50%**) साठी त्या–त्या विषयाच्या पदव्युत्तर अभ्यासक्रमातील आवश्यक(Compulsory) पेपरचा संपूर्ण अभ्यासक्रम राहील.

SHIVAJI UNIVERSITY, KOLHAPUR

Urdu

Research Methodology

Section I

(50% Part of Entrance Examination for Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

Unit-III Research Design-

Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design.

Unit-IV Methods, Collection and Analysis of Data:

Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation.

Unit-V Presentation of Research:

Citation Styles- APA, MLA etc., Research ethics and Plagiarism, Report writing- steps in report writing, layout of report writing, reference and bibliography.

Reference Books:

1) George J. (1964), The Science of Education Research, Eurasia Publishing House, New Delhi
2) William Philip at. Al (1973), Evaluation and Assessment of educational Studies: A third level course methods of educational enquiry, The Open University Press, Walton Hall Blethaley Buckinghamshire
3) Mariampolski H. (2001) Qualitative Market Research – A Comprehensive Guide Sage Publication, India Ltd, New Delhi
4) Black Thomas (2001), Understanding Social Science Research, Sage Publication, India Ltd, New Delhi
5) Fern Edward F.(2001) Advanced focus Group Research, Sage Publication, India Ltd, New Delhi
6) Michael V.P., 'Research Methodology in Management', Himalaya Publishing House, New Delhi.
7) Krishnaswami O.R. and Ranganatham M., 'Methodology of Research in Social Sciences', Himalaya Publishing House, New Delhi.
8) Kothari C.R., 'Research Methodology – Methods and Techniques', New Age International Publishers.
9) Pauline V. Young, 'Scientific Social Surveys and Research', Prentice-Hall of Indian Pvt. Ltd., New Delhi.

10) Sachdeva J.K., Business Research Methodology, Himalaya Publishing House, 2nd revised, 2011.
11) Sadhu and Singh, Research Methodology in Social Sciences, Himalaya Publishing House, Mumbai.
12) Wilkinson and Bhandarkar (2002), Methodology and Techniques of Social Research.
13) Barker, Nancy and Nancy Hulig (2000), A Research Guide for Under Graduate Students: English and American Literature, New York: Norton
14) Miller, R. H. (1995), Handbook of Library Research, Meghuen.
15) Rengachari, S. & Rengachari, Sulochana, Research Methodology for English Literaure, Bareilly
16) Sinha, M. P., Research Methods in English.
17) Research Methodology, H. V. Deshpande.

Additional Reference books for Urdu:

1. फने तहकिक – ज्ञानचंद जैन
2. तहकिक का फन – ज्ञानचंद जैन
3. फने तनकिंद और उर्दू तनकिदनिगारी
4. उर्दू अदब का मुतालिआ – सलाम संदेलबी
5. मुख्तसर तारीखेअदब – बे उर्दू – सयद ऐजाम हुसैन
6. तहरीक व तन्कीद – हमीद हसन कादरी
7. अदबी तन्कीद के उसुल – कणीमोथिन अहमद

Note:

The question paper of Hindi syllabi shall be translated in Urdu for candidates who are appearing for Urdu medium.

Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

विभाग – 2

उर्वरित Subject Specific(**50%**) साठी त्या–त्या विषयाच्या पदव्युत्तर अभ्यासक्रमातील आवश्यक(Compulsory) पेपरचा संपूर्ण अभ्यासक्रम राहील.

SHIVAJI UNIVERSITY, KOLHAPUR

Education

Section I

(50% of M. Phil. & Ph.D. (Education) Entrance Examination Syllabus on Research Methodology)

Research Methodology

Kinds of educational research: basic & applied research, evaluation research and action research, and their characteristics.

Sources of knowledge generation:

Planning the research study:

Identification and conceptualization of research problem: statement of problem, purposes, and research questions in qualitative and quantitative research. Formulation of Hypotheses.

Preparation of a research proposal; framework of the research proposal and strategies for writing the research proposals.

Quantitative and Qualitative Methods of Research

Types of Research: survey studies, descriptive studies, co-relational studies, developmental studies, comparative studies, casual-comparative and co-relational research; cross-sectional, longitudinal and retrospective.

Experimental Research

Experimental Research designs

Naturalistic enquiry : case studies and grounded theory.

Historical Research

Mixed Research

Sampling in Qualitative, Quantitative and Mixed Research

Concept of population and its type, sampling unit, Sampling frame, sample size, sampling error, representative and biased samples.

Random sampling techniques : simple random sampling, systematic

sampling, stratified random sampling, cluster sampling, and multi-stage sampling.

Non Random Sampling Techniques, convenience sampling, purposive

sampling, quota sampling, snowball sampling, theoretical sampling, incidental and critical case.

Methods of Data Collection – a) Tests, inventories and scales: types and construction and uses, identifying tool using reliability and validity information.

b) Questionnaire: forms, principles of construction and their scope in educational research, administration of questionnaires.

c) Interview : types, characteristics and applicability, guidelines for conducting interviews d) Qualitative process and quantitative process, observation: use of the checklist and schedules, time sampling, field notes, role of researcher during observation, focus group discussion.

Descriptive Analysis of Quantitative Data: a) Data types: Nominal, Ordinal, Interval and Ratio Scale, data levels: Individual and group graphical representation

of data. b) Description and comparison of groups: measures of central tendencies and dispersion, assumptions, uses and interpretation. c) Normal distribution: theoretical and empirical distributions, deviation forms normality and underlying causes, characteristics of normal probability curve and its applications. d) Relative positions: percentile rank z-scores. e)Correlation Coefficient

Inferential Analysis of Quantitative Data

a) Estimation of a parameter – Concept of parameter and statistics,

Sampling error, sampling distribution, standard error of mean. b) Testing of hypotheses – testing of null hypotheses, types of error, levels of significance, testing the significance of difference between the following statistics for independent and correlated samples: Proportions, means (including small samples) and variances. c) Analysis of variance and co-variance (ANOVA and ANCOVA)
d) Non-parametric statistics

Data Analysis in Qualitative and Mixed Research : Data reduction, data display, conclusion drawing and verification, removing, categorization and clarification, analysis of visual data, enumeration, identifying relationship among categories, context analysis, corroborating, establishing credibility.

Section - II

50% of M.Phil & Ph. D. (Education) Entrance Examination Syllabus based on compulsory Subject at post Graduate level.

Philosophy of Education

Interdisciplinary Nature of Education – relationships with disciplines/subjects such as Philosophy, Psychology, Sociology, Management, Economics and Anthropology

Interrelationship between philosophy & Education

Indian Schools of Philosophy - Vedic, Buddhist, Jainism, Islamic

Western Schools of Philosophy - Idealism, Naturalism, Pragmatism, Realism

Contribution of Swami Vivekananda, Rabindranath Tagore, Mahatma Gandhi, J. Krishnamurthy, Aurobindo to educational thinking.

Contribution of Plato, Rousseau, Dewey to educational thinking

Contemporary challenges of School Education

RTE – 2009 and Issues related to its implementation.

Equality and Equity in Education

Process of socialization and acculturation of the child – critical appraisal of the role of the school, parents, peer group and the community

Globalisation and Challenge before Education at different levels.

Impact of Globalisation on Knowledge, Skill and attitude

Psychology of Education

Learner and its development - Definition of learner, approaches for learning: Knowledge centeredness, Learner centeredness, Environmental centeredness and Assessment centeredness

Individual differences and its causes - socio - cultured andeconomic context

Learning Environment - Physical environment instructional time, discipline and participatory management

Cognition and Learning: cognitive process - perception attentionmemory development of concept, logical reasoning, critical thinking, problems solving

Concept and principles of brain based learning

Role of motivation and approaches to motivation: humanistic and cognitive

Diversity in learning path and learning styles

Learning disabilities

Dynamics of Individual Development

Dynamics of Social Development and Group Dynamics

Mental Health and Adjustment

Multiple Intelligences,

Human Development Index

Neuropsychology of Learning

Teacher Education

The need and importance of Teacher Education

Meaning, Nature, Scope of Teacher education

Aims and Objectives of teacher Education at different level

Pre-service and in-service teacher education : concept, nature, objectives and scope.

Need for pre-service and in service professional education of teachers at different levels in the present Indian situation.

Issues, concerns and problems of pre-service and in-service teacher education at secondary and senior secondary level.

Co-relationship of College of Education with Co-operating Schools

Evaluation procedures in Teacher Education

Teaching as a profession

Teacher Thought Process

Need of Research in Teacher Education

Current problems of Teacher Education

Teacher Education and National Curriculum Frameworks

Types of Teacher Education Programmes and Agencies:

Agencies of Teacher Education- UGC, NCTERT, SCERT, Colleges of Teacher Education, Open University.

Development of teacher education in India at secondary and senior secondary level, recommendations of various commissions and committees concerning teachereducation system. Impact of NPE, 1986 and its POA on teacher education system

Roles, functions and networking of institutions like UGC, NCERT, NCTE, NUEPA, SCERTs etc.

CCE in Teacher Education.

Formative and summative evaluation; norm referenced and criterion reference evaluation in teacher education.

Assessment of teaching proficiency: criteria, tools and techniques.

Structure of MIS school mapping at secondary level

Educational Technology

Meaning & Scope of Educational Technology

Interdisciplinary and Multidisciplinary approach to ET

Transactional usage of educational technology: integrated, complementary, supplementary, standalone (independent).

Major institutions of educational technology in India – CIET, EMMRC (AVRC, EMRC and MCRC), IGNOU, SIET, Consortium for Educational Communication (CEC), UGC, their role in education.

Components of Educational technology software and hardware.

Modalities of Teaching

Instructional Design System

Designing of Instructional strategies, such as lecture, team teaching, discussion, panel discussion, seminars & tutorials.

Systems Approach to Education and its Components: Goal Setting, Task Analysis. Content Analysis, Context Analysis and Evaluation Strategies.

Education and Training : Face-to-Face, Distance and other alternative modes

Overview of Models of Instructional Design – ADDIE Model; Instructional Design or Competency Based Teaching : Models for Development of Self Learning Material,

Review of Researches on Instructional Design.

Information Communication Technology

Interdisciplinary and Multidisciplinary approach to ICT

Communication Modes in education

Word Processors and Word Processing, Spreadsheets, Databases, Presentations, Digital Media, Graphics, Photographs, Animation, Audio and Video in the digital context; Sourcing, digitizing and using; Educational applications of digital media.

Online Learning, online courses and learning management systems

Use of ICT in Research,

ICT for Teaching Learning Process

Multimedia concept and meaning text, graphics, animation, audio, video

Web Resources for research, Blog and Professional Forum.

Multimedia applications

Educational software applications

SHIVAJI UNIVERSITY, KOLHAPUR

Physical Education

Section I

(50% of Ph.D. (Physical Education) Entrance Examination Syllabus on Research Methodology)

Research Methodology

Kinds of educational research: basic & applied research, evaluation research and action research, and their characteristics.

Sources of knowledge generation:

Planning the research study:

Identification and conceptualization of research problem: statement of problem, purposes, and research questions in qualitative and quantitative research. Formulation of Hypotheses.

Preparation of a research proposal; framework of the research proposal and strategies for writing the research proposals.

Quantitative and Qualitative Methods of Research

Types of Research: survey studies, descriptive studies, co-relational studies, developmental studies, comparative studies, casual-comparative and co-relational research; cross-sectional, longitudinal and retrospective.

Experimental Research

Experimental Research designs

Naturalistic enquiry : case studies and grounded theory.

Historical Research

Mixed Research

Sampling in Qualitative, Quantitative and Mixed Research

Concept of population and its type, sampling unit, Sampling frame, sample size, sampling error, representative and biased samples.

Random sampling techniques : simple random sampling, systematic

sampling, stratified random sampling, cluster sampling, and multi-stage sampling.

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a) Estimation of a parameter – Concept of parameter and statistics,

Sampling error, sampling distribution, standard error of mean. b) Testing of hypotheses – testing of null hypotheses, types of error, levels of significance, testing the significance of difference between the following statistics for independent and correlated samples: Proportions, means (including small samples) and variances. c) Analysis of variance and co-variance (ANOVA and ANCOVA)
d) Non-parametric statistics

Data Analysis in Qualitative and Mixed Research : Data reduction, data display, conclusion drawing and verification, removing, categorization and clarification, analysis of visual data, enumeration, identifying relationship among categories, context analysis, corroborating, establishing credibility.

Section - II

50% of M.Phil & Ph. D. (Physical Education) Entrance Examination Syllabus based on compulsory Subject at post Graduate level.

SHIVAJI UNIVERSITY KOLHAPUR

M.Phil., Ph.D. Entrance Exam Subjects mentioned below Syllabus

Implemented from Academic Year 2017-18

Important Note: Nature of Question Paper, Standard of passing & other rules shall be applicable as per new M.Phil./Ph.D. Prospectus for the Academic Year : 2017-18.

Home Science

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.

Tools for searching research topic – books, journals, internet, discussions etc.

Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.

Ethics in research – plagiarism

Unit 3: Research Methods

Types of data, Sources of data, Methods of data collection, Sampling and Sampling Techniques,

Unit 4: Research tools and techniques:

Tools of Data collection and their uses, Construction and adaptation of instruments, Administration of questions and tests, Tabulation of data, Data organization in SPSS and Excel, Graphical representation of data,

Data analysis: Discussion and Interpretation of results, Testing of Hypothesis, Logical and Statistical Technique

Reference Book:

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition, New Age International Publishers Pvt Ltd, New Delhi, 2004.

2. Syllabus for SET Examination Part I

References:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An Introduction to Research Methodology, RBSA Publishers.

2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.

3. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes.

4. Bagchi, Kanak Kanti (2007) Research Methodology in Social Sciences: A Practical Guide, Delhi, Abijeet Publications

5. Sharma, B.A.V., etal., (2000) Research Methods in Social Sciences, New Delhi, Sterling Publishers

6. Henn, Matt; Mark Weinstein and Nick Foard (2006) A Short Introduction to Social Research, New Delhi, Vistaar Publications.

7. Trochim, W.M.K., 2005. Research Methods: The concise Knowledge Base, Atomic Dog Publishing. 270p.

8. Krishnaswami, K. N., Appa Ayyar Shivakumar and M. Mathiarajan (2008) Management Research Methodology, Integration of Principles, Methods and Techniques, New Delhi, Dorling Kindersely (India Pvt. Ltd.)

Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Women Studies

Section - I

Research Methodology

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit-I Fundamentals of research-

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research

Unit-II Types of Research-

Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

Unit-III Research Design-

Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design.

Unit-IV Collection and Analysis of Data:

Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation.

Unit-V Presentation of Research:

Citation Styles- APA, MLA etc., Research ethics and Plagiarism, Report writing- steps in report writing, layout of report writing, reference and bibliography.

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5) Fern Edward F.(2001) Advanced focus Group Research, Sage Publication, India Ltd, New Delhi

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8) Kothari C.R., 'Research Methodology – Methods and Techniques', New Age
International Publishers

9) Pauline V. Young, 'Scientific Social Surveys and Research', Prentice-Hall of Indian Pvt. Ltd., New Delhi.

10) Sachdeva J.K., Business Research Methodology, Himalaya Publishing House, 2nd revised, 2011.

11) Sadhu and Singh, Research Methodology in Social Sciences, Himalaya Publishing House, Mumbai.

12) Wilkinson and Bhandarkar (2002), Methodology and Techniques of Social Research.

13) Barker, Nancy and Nancy Hulig (2000), A Research Guide for Under Graduate Students: English and American Literature, New York: Norton

14) Miller, R. H. (1995), Handbook of Library Research, Meghuen.

15) Rengachari, S. & Rengachari, Sulochana, Research Methodology for English Literaure, Bareilly

16) Sinha, M. P., Research Methods in English.

Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

(Law)

Section - I

Research Methodology

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit I: Objectives & Types of Research (Weightage 10%)

Introduction to Research, Defination and Characteristics of Analytical, Applied & Fundamental, Quantitative & Qualitative, Conceptual & Empirical, Doctrnal & Non-Doctrinal, Research Methods & Methodology, Interdisciplinary Approach

Unit II: Research Design (Weightage 10%)

Components of good Research Design Leasning objectives, Problem Indentification, Analysis & Statement of the Problem, Induction & Deduction method, Literature Review-Primary and secondary sources, observation of facts, Laws & theories, sources of Information, Formulation of Hypothesis/ Null Hypothesis, Alternative Hypothesis.

Unit III: Research Methodologies (Weightage 10%)

Plan for data collection, methods of Data collection (Primary and secondary data) Sampling Methods, concepts and study of population, variables, sampling, sample size determination, Field work, experimentation, case study method, survey Method, observation tools, Questionnaire, interview techniques etc.

Data Processing and Analysis stratergies, Data Analysis with statistical Packages, Hypothesis testing, Generalization and Interpretation.

Unit IV: Analysis & Interpretation of Data (Weightage 10%)

Processing & Analysis of Data, Types of Analysis Statistical tools in Research, multiple techniques of analysis (Frequency tables, bar chart, pie chart, tabulation, percentages, chi-square etc.)

Techniques of Interpretation, Research layout & Report writing

Unit V: Thesis writing & Scientific editing tools (Weightage 10%)

Mode of Citation and acknowledgement (APA, MLA, Bluebook etc.), Bibliography, use of encylopedia. Computer Application in legal Research, use of various softwares, web search, use of internet, search engines, use of advance search tools, Ethical issues related to Plagiarism, copy right, Reproduction of published material, self Plagiarism.

Section – II

Remaining 50% shall be based on Subject Specific as mentioned below

(Titles of Papers of LL.M Programme)

Paper - I a) General Principles of Contract including Government and Multinational Contracts

b) Corporate Finance.

Paper - II Jurisprudence

Paper - III a) Philosophical and Historical Foundations of Human Rights and Duties.

b) Protection and Enforcement of Human Rights and Duties.

Paper - IV Indian Constitutional Laws and New Challenges

Paper - V a) Penology : Treatment of ofenders

b) Comparative Criminal Proocedure.

Agrochemicals and pest Management

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.

Tools for searching research topic – books, journals, internet, discussions etc.

Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.

Ethics in research – plagiarism

Unit 3: Research Methods

A. Chemical Science

Designing of synthesis of agrochemicals such as pesticides, plant growth regulators, pheromones, natural products using retro synthetic analysis approach. Analysis of soils, analysis of fertilizers, pesticide residues analysis methods (Organochlorine, organophosphorus, Carbamate, synthetic pyrethroid) monitoring of pesticides in water, soil and air, Isolation, Identification of Natural pesticides.

B. Life sciences

Collection, mounting and preservation of insect pests, nature of damage due to pest attack, assessment of crop loss, screening of biological control agents, conservation techniques of biological control agents, methods for studying biology, feeding efficancy, mass production and field release techniques, impact assessment, Benefit-cost ratio of biological control agents of pests.

Crop disease assessments: Diagnosis based on symptoms, immunological techniques-monoclonal and polyclonal antibodies, nucleic acid probe based methods, plant clinics, digitally assisted diagnosis.

Genetic Engineering: Transgenic plants expressing plant resistant genes, defense genes, genes involved in signal transduction and genes encoding antibiotics.

Unit 4: Research tolls & Techniques

A. Chemical Science

Application of IR, NMR, GCMS, AAS & LCMS in Agrochemicals analysis. Detection and measurement of Radioactivity. G. M. and scintilatllation counters. Use of fluorescent materials and synthetic pigments in agrochemicals analysis.

B. Life sciences

Tools used for studying morphology, collection and preservation of insects, rearing tools for silkworm, honeybee, pests and their biological control agents, mass multiplication and field release tools for insects, plant protection appliances, pesticide formulations, controlled release of fertilizers and pesticides, computer assisted correlation analysis in the development of pesticide formulations

Chromatography techniques - paper chromatography, TLC, GC, Two dimensional chromatography, Microscopy - Phase contrast microscope
Microphotography, Micrometry techniques, Tissue culture techniques, Patho-Physiological techniques

Reference Book:

Research Methodology Methods and Techniques, C. R. Kothari, IInd revised edition, New Age International Publishers Pvt Ltd, New Delhi, 2004.

2. Syllabus for SET Examination Part I

Reference Book:

1. Plant Pathology 5th Edition by G. N. Agrios
2. Principles of plant pathology by Tarr, S. S. J., 1972
3. N. N. Melnikov: Chemistry of Pesticides (English) Springer
4. R. Clemlyn: Pesticides
5. Agriculture pest of India and South East Asia by A. S. Atwal
6. A textbook of applied entomology by K. P. Srivastava
7. Instrumental methods of chemicals analysis by Willard, meritt & Dean.
8. Analysis of pesticide residues by H. A. Moye.
9. Microbial Biotechnology, by Reddy S. M., 1997
10. Toxicology of insecticide – Fumio Matsumura
11. Spectroscopic methods in organic Chemistry – D. H. Williams and I. Flemming
12. Instrumental methods of analysis – Willard and merittee, Dean.

Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme

Environmental Science

Research Methodology (Section I)

(50% Part of Entrance Examination for M. Phil. & Ph.D. Admission)

Unit 1: Fundamentals of Research

Aims and objectives of research, Types of research – basic, novel and applied research.

Tools for searching research topic – books, journals, internet, discussions etc.

Research hypothesis, Steps in research design.

Unit 2: Research Aptitude

Qualities of a researcher, Logical reasoning, Test for intelligence, Basic mathematics.

Ethics in research – plagiarism

Unit 3 : Research methods

a) Formulating a research problem, features of good research designs, scientific, Developing a research plan
b) Methods: Experiments, surveys, Questionnaires, Interviews, Telephone Surveys, mail surveys, Case Studies, Participant and non participant observation, observational trials.
c) Sampling design: Census and sample surveys, implication of sample design, types of sample design
d) Method of sample collection: Collection of primary data, Collection of Secondary data, Sampling distribution, Validation of data
e) Processing and analysis of data: Statistics in research, Measures of central tendency, measures o dispursion, measures of assymetry, Simple regression analysis, use of computers in research, Hypothesis testing, Chisquare test, Students ‘t test, ANOVA test
f) Interpretation and report writing: preparation of tables and graphs, Observation writing and its interpretation, Report format

Unit 4: Research methods

a) Laboratory experiments, field trials, use of instruments, observations
b) Interviews, Questionaire surveys, Telephone survey, mail Survey, Postal survey, checklists.
c) Case studies and trails.
d) Immunochemical, Centrifugation, Electrophoretic and Chromatographic techniques
e) Microscopy- compound, Flurescence, phase contrast, electron microscope.

References:

1. Research Methodology: The aims, Practices and ethics of science By Peter Pruzan- Springer
2. Principles and Techniques of Biochemistry and molecular Biology by Keith Wilson and John Wolker
3. Research Methodology and Project work by Dr. Prakash Herekar, Phadake Prakashan.
4. Research Methodology methods and Kolhapur Techniques (second revised edition) by C. R. Kothari, New Age Publishers.

Section - II

Remaining 50% shall be based on Compulsory Subjects (Subject Specific) of concerned Master's Degree Programme