

UNIVERSITY OF KALYANI

Curricula of Ph.D. Course work (IPP)-2017 (June to December)

Paper I (Candidate has to opt 4 Units; University Level) : IPP 501 (Research Methodology)		Credits : 4 Marks : 100
Unit	Content	Credit distribution & Lecture hours
IPP 501.1	Research Formulation: Objectives and motivation of Research – Research Methodology <i>vs</i> methods. Types of research – Descriptive, Analytical, Applied, Fundamental, Quantitative, Qualitative, Conceptual, Empirical etc; Approaches to Research: Preparation of Schedule, Case study approach, Comparison approach, Definition approach, Descriptive approach, Evaluative approach, Exploratory approach, Interpretive approach, Narrative approach, Persuasive approach, Policy memorandum approach. Definition and formulation of the research problem – Selection of the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Literature review – Primary and secondary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literature review – Development of working hypothesis.	Credit – 1 Lecture Hours – 15
IPP 501.2	Data Collection and analysis: Execution of the research - Observation and Collection of data - Methods of data collection – Sampling Methods- Data Processing and Analysis strategies - Data Analysis with Statistical Packages - Hypothesis-testing - Generalization and Interpretation.	Credit – 1 Lecture Hours – 15
IPP 501.3	Reporting and thesis writing: Structure and components of scientific reports - Types of report – Technical reports and thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports – Illustrations and tables – Bibliography, referencing and footnotes	Credit – 1 Lecture Hours – 15
IPP 501.4	Application of results and ethics: Environmental impacts - Ethical issues - ethical committees. Intellectual property rights (IPR): kinds of property, nature of IP, basic principle, major IP, moral rights & economic rights; Copy right, patent, industrial design, trade mark, geographical indication, farmers’ right, IPR licensing & technology transfer; Reproduction of published material- plagiarism, citation and acknowledgement. Reproducibility of IP and accountability.	Credit – 1 Lecture Hours – 15
IPP 501.5	Presentation of Results: Poster presentation, Oral presentation, Software related to presentation, layout and structure. Oral presentation – Planning – Preparation – Practice – Making presentation – Use of visual aids - Importance of effective. Communication. Writing an Abstract: Importance, Types: Critical Abstract; Descriptive Abstract; Informative Abstract; Highlight Abstract; Writing Style. Writing Introduction: Background Information, Research Questions, Theoretical Framework. Writing a Case Study: Identifying a Case, Structure and writing style, Limitations. Writing a Field Report: Objects to observe, Obtaining consent, Field Notes, Techniques to Record Observation. Writing an Executive Summary; Policy Memo Writing a Book Review: Descriptive; Critical. Proof Reading: Strategies to identify errors; use of computer checking, common grammatical errors. Group Projects: Goals, Planning, Preparation and Implementation	Credit – 1 Lecture Hours – 15
Paper II (Candidate has to opt 4 Units; Cluster Level) : IPP 502 [SC] (Subject up gradation-Interdisciplinary)		Credits : 4 Marks : 100
Unit	Content	Credit distribution & Lecture hours
IPP 502.1 (Biology)	<p>i) <i>Biochemistry & Biophysics:</i> Spectroscopy, Microscopy, Crystallography, Chromatography, Electrophoresis, Principle & application of PCR technique, flow cytometry, immunotechniques, Bioinformatics & in silico biology; Mammalian & parasite cell culture techniques. Mutation and its analysis.</p> <p>ii) <i>Molecular Biology & Biotechnology:</i> Plant tissue culture techniques & application, Principle of gene cloning, Development of GMOs: different issues on its commercial application. Bioprocess technology. Systematics and conservation biology, DNA bar-coding.</p> <p>iii) <i>Physiology:</i> Recent advances in structure and function of physiological system, molecular neurotoxicology, environmental</p>	Credit – 1 Lecture Hours – 15

	<p>physiology, ergonomics, occupational physiology, cell biology. Advanced research methods in haematology, pulmonary & cardiovascular physiology, neuromuscular physiology, reproductive & endocrine physiology and histo-chemistry.</p> <p>iv) <i>Zoology</i>: Basic concept of aquaculture; Common parasitic diseases; Stem cell and its therapeutic uses; Genetic abnormalities & its social consequences; Insect in relation to public health.</p> <p>v) <i>Microbiology</i>: Newer approaches for exploring non-culturable bacteria; environmental factors & bacterial diversity. General account of bacterial control. Public health & disease emergence. Basic principle of immunology.</p> <p>vi) <i>Botany</i>: Ethnobotany & plant resources in human welfare. Algae and fungi in sustainable development. Fossil and its application. Plant resource conservation & population genetics. Microbes & plant interaction.</p>	
IPP 502.2 (Chemistry)	Analytical methodologies, Interpretation of analytical data/results, Coordination chemistry, Solution chemistry, Organometallic chemistry, Catalysis, Stereochemistry, Natural products, Supramolecular chemistry, Carbohydrate chemistry, Nanomaterials, Polymers, Biophysical chemistry, Fluorescence spectroscopy, Thermodynamics, Kinetics	Credit – 1 Lecture Hours – 15
IPP 502.3 (Physics)	2 nd order differential equation; Fourier series and transformation; Lagrangian & Hamiltonian Formulation of mechanics; Central force problem; Electromagnetic waves; Maxwell's equations; Basic idea of quantum physics; Schroedinger equation and its applications; Distribution theory; Equipartition theorem; Semiconductor physics and Transistors; Logic Gates; Powder X-ray diffraction technique; Basics of Nuclear physics; Different Elementary particles & their properties.	Credit – 1 Lecture Hours – 15
IPP 502.4 (Mathematics and Statistics)	Calculus: Linear Algebra: Ordinary Differential Equations; Partial Differential Equations ; Numerical Analysis ; Linear Programming Problem. Exploratory Data Analysis- Box-Plot, Stem-and-Leaf Diagram; Frequency Distribution: Descriptive measures- Mean, Variance, Coefficient of Variation, Binomial, Poisson and Normal Distribution. Elements of Probability Theory – Classical Definition of Probability, Theorem of Total Probability, Conditional Probability and Independence. Problem of Point Estimation – Unbiased Estimator, Minimum Variance Unbiased Estimator, Maximum Likelihood Estimator. Chi-square test and t test involving means of normal distribution, ANOVA Problem – One-way and two-way layouts.	Credit – 1 Lecture Hours – 15
IPP 502.5 (Earth Science, Environmental and Ecological Studies)	Development of Chemo-sensor, adsorption and degradation studies, land use and environment, water resource development. RS and GIS applications in environment, lithosphere, Ecological system and applied ecology. Concept of Scale and use of Thematic Maps. Ecotoxicology, Bioremediation.	Credit – 1 Lecture Hours – 15
Paper II (Candidate has to opt 4 Units; Cluster Level) : IPP 502 [ACE] (Subject upgradation-(Interdisciplinary))		Credits : 4 Marks : 100
IPP 502.1	Indian Society and Culture in historical and contemporary perspectives, Multiculturalism, Ethnicity, New Social Thoughts and movements (including environmental movement, Indian Polity, Impact of Globalization on Indian society, Post Modernism, World Politics and terrorism, Feminism (including eco-feminism), Women's Empowerment, Gender discrimination & Gender Violence, Diaspora	Credit – 1 Lecture Hours – 15
IPP 502.2	Money Market, Capital Market, Management Principles, Human Development, Social Sector in India, Globalization, Information resources for research, Online search and retrieval process, Open access and research support tools, Gender Budget, Decentralized Planning, Tribal & Rural Development	Credit – 1 Lecture Hours – 15
IPP 502.3	Ādhunik Bānglār Bikāsh ,Hindi Jāti, Hindi Navjāgran, Hindi Navjāgran, Bāstabatār Suchanā, Shruti, Tribarga, Abhilekha, Rājbhāshā, Rāstrabhāshā, Samparkbhāshā, Nabajāgaran, Narrative, Discourse, Text	Credit – 1 Lecture Hours – 15
IPP 502.4	i) <i>Education</i> : Individual difference and its importance, Schools of Philosophy, Theories of Learning, Education & Leadership, Education, Stratification & Social Mobility ii) <i>Lifelong Learning & Extension</i> : Globalization & Lifelong Learning(LL), Learning & Micro Enterprises, Knowledge Society & Lifelong Learning, Skills, Competencies, & Qualifications within the context of LL, Lifelong Learning & Democratic Citizenship iii) <i>Physical Education</i> : Physical Literacy, Fitness, & Wellness, Anthropometry & Functional Health, Play Theories & Childhood, Yoga for Holistic Health & Stress Management, Sports & Olympic Movement	Credit – 1 Lecture Hours – 15

IPP 502.5	Method of philosophical Enquiry (Indian and Western), Dilemma (Indian and Western)/ Philosophical problems (selected portion), Ethics and society (selected portion), Swaraj in Ideas: K.C. Bhattacharya, Philosophy of Religion (Selected portion), Folklore & Tribal lore, Folklore & Media, Folklore & Tourism, Applied Folklore, Comparative Folklore, Elements of art: Line, Form, Colour, Perspective, Dimension, Surface, Hue, Pigment. Evolution of Indian Art: From Indus Valley Civilization to Bengal Renaissance/ Post Independent Era. Evolution of Western Art: From Renaissance to Modern Art. Relation between Art and Aesthetics. Contemporary Art of India	Credit – 1 Lecture Hours – 15
Paper II (Candidate has to opt 4 Units; Cluster Level) : IPP 502 [ETM] (Subject upgradation-(Interdisciplinary))		Credits : 4 Marks : 100
IPP 502.1	Computing Technologies : Image Processing, Optical Computing and Sensor Networks, Cloud Computing, Security & Authentication, Bio Inspire Computing, Analysis of Algorithm	Credit – 1 Lecture Hours – 15
IPP 502.2	Data Science and Statistical Computing : Data science & Data Analytics Applications, Use of Statistics in Computing, Introduction to Big Data and Data analytics, Concept of Machine Learning methods like SVMs, Random Forests, Gradient Boosting and Neural networks	Credit – 1 Lecture Hours – 15
IPP 502.3	Web Based Management : Web-based management, OLAP & OLTP, E-commerce, Web-analytics, Semantic Web	Credit – 1 Lecture Hours – 15
IPP 502.4	Electronics Instrumentation : Sensor & Transducer, Introduction to control Theory, Measurement Process by VNA/Spectrum Analyzer, LED, LASER, CRO, Frequency meter, microwave Generator	Credit – 1 Lecture Hours – 15
IPP 502.5	Communication Engineering : Analog and Digital modulation, Electromagnetic Theory, Microwave sources, Microstrip Antenna, Frequency Selective Surface	Credit – 1 Lecture Hours – 15
Paper III (Computer & Department Level) : IPP 503 (Computer Application and Subject upgradation)		Credits : 4 Marks : 100
IPP 503.1 (Computer Application) (any ONE) A /B /C	<p>A. Office Tools & Technology : Office document Management, Typesetting, Use of office Tools, Use of layout software, Preparation of Power Point Presentation, Table Management using Excel, Use of Internet. Searching of databases, Editing</p> <p>B. Technology and Tools for Research : Brief description of Computer Hardware & Software, Preliminary knowledge of Computer Technology, Peripheral devices and their uses, Preliminary knowledge of Operating Systems, Basic Microsoft Excel. Basic Microsoft Power Point, Internet Technology: uses and configurations. Editing</p> <p>C. Data Science & Statistical Tools : Brief description of Computer Hardware & Software, Preliminary knowledge of Data Base System, Basics of Operating Systems, Statistical packages, Statistical Computing, Internet Technology and its internal architecture.</p>	Credit – 1 Lecture Hours – 15 (any one of the categories)
IPP 503.2 (Subject upgradation)	Candidates' selected subject of research to be provided by the respective Department	Credit – 3 Lecture Hours – 45
Paper IV (Supervisor Level) : IPP 504 (Review work-Supervisor)		Credits : 4 Marks : 100
	<p><i>i.</i> Interaction with mentor to select the field of research</p> <p><i>ii.</i> Literature survey</p> <p><i>iii.</i> Presentation of literature in regards to objective of work</p> <p><i>iv.</i> Compilation of a mini review from the surveyed literatures for submission</p>	

Venue & Schedule of Ph. D. Course Work (From June 01, 2017)

Day	10.45- 12.15 (including mobility) (Vidyasagar Sabhagriha)	12-15 to 1-30 (Cluster level) [VS/ APC/ ETM labs]	Recess 1-30 to 2-00 pm	2 p.m. to 3 pm [CIRM/ ETM labs + Department]	3 p.m. to 4 p.m (Supervisor)
Monday	Research Methodology	Subject upgradation (Interdisciplinary)	R e c e s s	Computer application (Gr. A)	
				Subject upgradation	Review work
Tuesday	Research Methodology	Subject upgradation (Interdisciplinary)		Computer application (Gr. A)	
				Subject upgradation	Review work
Wednesday	Research Methodology	Subject upgradation (Interdisciplinary)		Computer application (Gr. B)	
				Subject upgradation	Review work
Thursday	Research Methodology	Subject upgradation (Interdisciplinary)		Computer application (Gr. B)	
				Subject upgradation	Review work
Friday	Research Methodology	Subject upgradation (Interdisciplinary)		Computer application (Gr. C)	
				Subject upgradation	Review work