MOTHERHOOD UNIVERSITY, Roorkee

ENLIGHTENING WORLD

Doctor of Philosophy (Ph.D.)
COURSE WORK SYLLABUS

FACULTY OF SCIENCES
(MICROBIOLOGY)

Implemented from June, 2017 onwards

Roorkee-Dehradun Road, Village Karoundi
Post Bhagwanpur, Tehsil Roorkee
District Haridwar, Uttarakhand

Compulsory Course - I

PAPER I- Research Methodology and Computer Applications

Section I: Research Methodology **Max. Marks: 100**
6 Credits (70 External+30 Internal)

Objective:

- To enable to student to understand and work methods and concepts related Research.
- To enable the student to develop research proposal and to work with research problem.
- To develop broad comprehension of research area.

UNIT –I : Concept of Research **10 hrs (20 Marks)**

Meaning, Concept, nature steps types and characteristics of research., Types and approaches , Ethics in Research and Plagiarism, Scientific Inquiry, Philosophical and Sociological foundations of research, Interdisciplinary approach and its implications in various research area.

Unit II: Types and Methods of Research **10 hrs (20 Marks)**

Qualitative and quantitative methods of research like Descriptive, Historical, Case study, Ethnography, Ex-post facto, documentary and content analysis, survey field and laboratory experimental studies. Characteristics of methods and their implications in research area.

Unit III: Development of research proposals **10 hrs (20 Marks)**

Research proposal and its elements, Formulation of research problem-criteria of sources and definition, Development of objectives and characteristics of objectives, Development of hypothesis and applications.

Writing a Research Paper, Choosing a Topic, Preparing a Working Bibliography, Outlining and need to write a Research Paper

Unit IV: Methods of data collection & data analysis **10 hrs (20 Marks)**

Concept of sampling and other concepts related to sampling. Probability and non-probability samples, their characteristics and implications. Tools of data collections, their types, attributes and uses. Redesigning, research tools-like questionnaire, observation, interviews, scales and tests etc.

Analysis of qualitative data based on various tools. Analysis of quantitative data and it presentation with tables, graphs etc. Statistical tools and techniques of data analysis-measures of central tendency, dispersion. Decision making with hypothesis testing through parametric and non-parametric tests.

Validity and delimitations of research findings.

Section II: Computer Applications

Unit V: **20 hrs (20 Marks)**

Basic Knowledge of Computer, Use of Internet for Research Purpose: E-mail, WWW, Web browsing, acquiring technical skills, drawing inferences from data, Use of technology and other equipment in Research, Research publishing tool-MS Word, Adobe acrobat, Graphics tool-MS Excel, Presentation tool-MS Power, Data Analysis Software and Analysis Techniques point. Application of Internet in research : INFLIBNET, Use of Internet, sights (DOAJ), Use of E Journals, Use of E library, use of EBSCO HOST online database of Academic Libraries.

References:

- Best, J.W. (1995) & Kahan, J.V. – Research Education, Prentice Hall of India Pvt. Ltd., New Delhi.
- Edwards, A.L. (1960) – Experimental Design in Psychological Research, New York, Holts (revised Ed.).
- Ferguson, G.A. and Takane Yoshio (1989) – Statistical Analysis in Psychology and Education.
- Garrett, H.E. (1986) – Statistics in Psychology and Education, Vikils Feffers and Simmons Pvt. Ltd.
- Kaul Lokesh (1984) – Methodology of Educational Research, Vikas Publishing House Pvt. Ltd., New Delhi.
- Sukhiya, S. P. : Melhotra P.V., Elements of Educational Research, New Delhi, Allied Publishers.
- Tuckman, B.W. (1972) – Conducting Educational Research, Harcourt Brace, Javanovich.
- Verma, An Introduction to Educational and Psychological Research, Bombay, Asia Publishing House.
- Lindquist, E.F. (1960) – Elementary Statistical Methods in Psychology and Education, Oxford Book Company, New Delhi.
- Sharma, A.R. (1984) Fundamentals of Educational Research, Loyal Book Depot, Meerut.
- Sanders, D.H., Computer Today, NY: McGraw Hill, 1981
- Sinha, P.K., Computer Fundamentals, New Delhi: BPB Publications, 1992
- Cox, J. And Urban, P. “Quick Course in Microsoft Office. Galgotia Publications, New Delhi,
  1990.
- Jain, Satish: “Introduction to Computer Science and basic Programming.” BPB Publications,
  New Delhi, 1990.
- Rajaraman, V., “Fundamental of Computers”, Prentice Hall of India, New Delhi, 1996.
- Saxena, S., “A First Coursein Computers”, Vikas Publishing House Pvt. Ltd., New Delhi,
  1998.

COURSE WORK SYLLABUS
CORE PAPER –II
MICROBIOLOGY

Total Credits : 6 Credits **Max. Marks 100**

UNIT - 1

Microbial growth and growth kinetics: Bacterial growth curve, generation time, measurement of microbial growth, growth kinetics, synchronous culture, continuous and batch culture, chemostat and turbidostat, environmental factors affecting growth, nutritional diversity in bacteria.

UNIT - II

Diversity and regulation of glucose metabolism in microbes – Embden-Meyerhof- Parnas pathway - Variations of EMP pathway in different groups of bacteria; Overall balance sheet; Regulation; Modes of NAD regeneration; alcoholic and lactic acid fermentation, Pentose phosphate pathway – HMP pathway and its link with glycolysis, Fermentative mode of glucose oxidation - Entner-Doudoroff pathway; variations of ED pathway in different groups of microbes and its implications, Fate of pyruvate, Citric acid pathway – Stoichiometry and energy gain; Regulation; Alternate forms of TCA; Reductive TCA; Branched TCA; Glyoxylate cycle

UNIT - III

Nitrogen metabolism - Nitrogen assimilation, GS-GOGAT pathway and its regulation, Utilization of other modes of nitrogen, nitrate and nitrite utilization, amino acid biosynthetic pathways and their regulation, amino acid utilization – reduction amination and deamination; decarboxylation; Stickland reaction; amino acid oxidases, polyamine biosynthesis and utilization

UNIT - IV

Lipid metabolism – Biochemistry of lipids, lipid distribution in different groups of microbes,fatty acid biosynthesis, synthesiws of different types of lipids – neutral lipids; phospholipids and glycolipids, biosynthesis of archaeal lipids, synthesis of storage lipids, lipid utilization, beta-oxidation pathway – regulation and energy calculation, Lipid accumulation pathway, biochemical and molecular distinction between oleaginous and non-oleaginous microbes

UNIT - V

Programming metabolism in relation to overproduction of selected metabolites -Introduction to primary and secondary metabolism, classification of secondary metabolites, introduction to metabolic engineering – strain development and pathway engineering, Case studies on primary metabolites viz. citric acid, succinic acid, lactic acid, ethanol fermentation, amino acid pathways

References:

- "Physiology and Biochemistry of Prokaryotes" by David White, published by Oxford University Press, 4th edition, 2011
- "Microbial Biochemistry" by G. N. Cohen published by Springer Netherlands, 3rd edition, 2014
- "Microbial Physiology" by Albert G. Moat, John W. Foster, Michael P. Spector, published by John Wiley & Sons, 4th edition, 2002
- "Biochemistry" by Geoffrey Zubay, published by William C Brown, 4th edition, 2002
- "The Metabolic Pathway Engineering Handbook" by Christina Smolke, published by CRC Press, 2009