Syllabus for Course Work
(As prerequisite for Ph.D. registration)

ELECTRONICS & COMMUNICATION ENGINEERING DEPARTMENT

2017-18

Sl. No.	Course Code	Course Name	Course Contents	Credit
1	EC 1301 C	Research Methodology I	Shall be prepared / notified by TU authority	4
2	EC 1302 C	Research Methodology II	Review and critique of published research in the relevant field, training, field work, communication skill etc	4
3	EC 1303 C	Advanced area of research in the subject	Advanced area of research in the subject	4
4	EC 1304 C	Seminar / Practical / Project and Assignments	Seminar / Practical / Project and Assignments	4

Course-I: Basic Computer Applications, Quantitative methods, Statistics and application of Computer in statistics, Research Ethics and IPR, Documentation and scientific writing

Unit-1: Basic Computer Applications

Basic computer knowledge, Features and applications related to presentation of text in suitable format and saving the data for future applications.

Use of word processing, Practical knowledge of MS Word to type the script, insert tables, figures and graphs, plotting of graphs in excel, Preparation of power point presentations based on the topic of research. Insertion of figures, graphs, charts in presentation. Use of spreadsheet and database software, Preparation of scientific posters for presentations

Internet and its application: Email, WWW, Web browsing, acquiring technical skills, dra wing inferences from data, Cloud computing.

Unit-2: Quantitative methods, Statistics and application of Computer in statistics

Measures of Central tendency and Dispersion. Probability distribution- Normal, Binomial and Poisson distribution. Parametric and Non-parametric statistics. Confidence interval, Errors.

Quantitative Techniques: Levels of significance, Regression and Correlation coefficient. Statistical analysis and fitting of data; Chi- Square Test, Association of Attributes t- Test Anova, Standard deviation, Co- efficient of variations. Open source software for quantitative and statistical analysis.

Unit-3: Research Ethics and IPR

Environmental impacts - Ethical issues - ethical committees - Commercialization – Copy right – royalty - Intellectual property rights and patent law – Trade Related aspects of Intellectual Property Rights – Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability.

Unit-4: Documentation and scientific writing:

Results and Conclusions, Preparation of manuscript for Publication of Research paper, Presenting a paper in scientific seminar, Thesis writing. Structure and Components of Research Report, Types of Report: research papers, thesis, Research proposal, Research Project Reports, Pictures and Graphs, citation styles, writing a review of paper, Bibliography.

Course-II: Review and critique of published research in the relevant field, training, field work, communication skill etc.

A research paper is based on original research. A review article or review paper will be based on other published articles. It will not support original research. Review articles will summarize the existing literature on a topic in an attempt to explain the current state of understanding on the topic. Training and field work will be based on different hand on experiments and measurement results on research topics. Communication skill will be improved for betterment of research paper and thesis writing.

Course-III: Advanced area of research in the subject

[Choose any one from (a), (b) & (c)]

a) Advanced Electromagnetic Theory and Antennas:

Fundamental concepts of electromagnetics: Maxwell equations, Lorentz force relation, electric and magnetic polarizations, constitutive relations, boundary conditions, Poynting theorem in real and complex forms, energy relations. Solution of Helmholtz equation: plane, cylindrical, and spherical waves, dispersion, phase and group velocities, attenuation, wave propagation in anisotropic media. Electromagnetic theorems: uniqueness, duality, reciprocity, equivalence, and induction theorems, Huygen and Babinet principles. Guided wave propagation: mode expansions, metallic and dielectric waveguides, resonant cavities. Antennas: potentials, radiation, elementary antennas. Broadband Antennas: Broadband concept, Log-periodic antennas, frequency independent antennas. Microstrip Antennas: Basic characteristics of Microstrip antennas, feeding methods, methods of analysis, design of rectangular and circular patch antennas.

b) Optical Communication & Photonics

Optical fiber wave guiding concepts, Attenuation in optical fiber, Types of optical fibers, linear and nonlinear impairments, optical transmitter, Modulators, and Receivers; Optical system Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical amplifiers, Optical fiber transmission system, Optical Channel performance monitoring system: Eye diagram, EOP, BER etc., WDM system, OADM, OLT, Optical networks: SONET/SDH, protection techniques, Switching techniques, PON. Free Space optical Communication: Channel Analysis, Optical sensor: MZI, ring resonator, FBG etc, Optoelectronic Basic principle, Optoelectronic Integrated Circuits: Directional couplers, Dividers, Multiplexers, Phase and Amplitude Modulators, Polarization and polarization controllers, etc. Photonics Signal processing, Nonlinear optics- Frequency Converters, Phase conjugation.

c) Advanced Engineering Mathematics:

Numerical Analysis: Introduction, Interpolation formulae, Difference equations, Roots of equations, Solutions of simultaneous linear and non-linear equations, Solution techniques for ODE and PDE. Optimization Technique: Calculus of several variables, Implicit function theorem, Nature of singular points, Necessary and sufficient conditions for optimization. Probability and Statistics: Definition and postulates of probability, Field of probability, Mutually exclusive events, Bayes' Theorem, Independence, Bernoulli trial, Discrete Distributions, Continuous distributions, Probable errors, Linear regression, Introduction to non-linear regression, Correlation, Analysis of variance.

Course - IV: Seminar / Practical / Project and Assignments

A. Practical_1

(i) CST (Computer Simulation Technology) Microwave Studio
(ii) HFSS (High Frequency Structure Simulation)
(iii) Matlab

Or

Practical_1

(i) Matlab/Octave
(ii) RSoft/Optiwave

B. Seminar on the chosen area of proposed research.