SCHEME OF EXAMINATION
& SYLLABUS of
Course Work for Ph.D.(ELECTRONICS)

PROGRAMME

FACULTY OF SCIENCE

Approved by Board of Studies in Electronics

Effective from Academic Session from starting

JULY 2020

School of Studies in Electronics and Photonics
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SCHEME OF EXAMINATION & SYLLABUS PRESCRIBED FOR THE EXAMINATION OF COURSE WORK FOR Ph.D. (Electronics)

EFFECTIVE FROM JULY 2020

Scheme of Examination

The Course Work for PhD degree in Electronics is a six month course after completion of P.G. Degree in the subject. There shall be two compulsory papers based on the research areas of Electronics discipline. The structure of the course is given below:

S No	Theory Paper	Marks
1.	Research Methodology, Quantitative Methods & Computer Applications	100
2.	Review of Literature in Concerned Subject, Seminar/ Project Report	100
Total		**200**

Paper I

Research Methodology, Quantitative Methods & Computer Applications

Unit I - Introduction and Design of research

Meaning, objective and significance of research, types and parameters of research, research process, identification and definition of the research problem, definition of construct and variables, pure and applied research design, exploratory and descriptive design methodology, qualitative Vs quantitative research methodology, field studies, field experiments Vs laboratory experiments, research design in social and physical sciences.

Unit II - Data Analysis

Procedure for testing of Hypothesis, the null hypothesis, determining level of significance , type I and type II errors, grouped data distribution, measures of central tendency, measures of spread/dispersion, normal distribution, analysis of variance: one way, two

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way, Chi square test and its application, students 'T' distribution, non parametric statistical techniques, binomial test, Correlation and regression analysis- discriminate analysis- factor analysis- cluster analysis, measures of relationship.

Unit III – Solar PV fundamentals and Emerging Solar Cell Technologies

P-N junction under illumination: Generation of Photo voltage, Light Generated current,, I-V equation, Solar Cell Characteristics, parameters of solar cells, Relation of Voc and Eg
Design of solar cells: Upper limit of cell parameters, Losses in Solar Cell, Design for High Isc, Voc and FF
Analytical Techniques: Solar Simulator-IV measurement, Quantum efficiency measurement, Minority carrier lifetime & diffusion length measurement.
Thin film solar cell technologies,: amorphous Si solar cells, CdTe solar cells, Quantum Dot Solar Cells, Dye Sensitized Solar cells, Perovskite Solar Cells, Present status of different PV technologies, Shockley-Queisser limit.

Unit IV – Molecular Devices and Semiconductor Device Simulation

Molecular Devices: Operation fundamentals of organic LEDs, Organic FETs and Organic solar cells, Basic physics underlying device operation, Fundamental benefits and limitations of the organic materials
Introduction to Semiconductor Device Simulation: Need of Simulation, Process Simulation, Device Simulation device simulation sequence, hierarchy of transport models, DD Model, Relationship between various transport regimes and significant length-scales.
Numerical Solution Methods - finite difference scheme, discretization of Poisson's and current continuity equations.

Unit V - Image Fundamentals –

Digital Image representation, fundamental steps in Digital Image processing, image acquisition, storage, processing, communication & display, Simple image model, sampling and quantization, some basic relationships between pixels: Neighbors of a pixel, connectivity, labeling of connected Components, Relations, distance Measures.
Image Transforms
Introduction to Fourier Transform, The Discrete Fourier Transform, some properties of two dimensional Fourier transform: Separability, translation, periodicity & conjugate symmetry, rotation, distributive and scaling, average value, convolution and correlation, sampling. The Fast Fourier Transform: FFT algorithm, number of operations, the inverse FFT, implementation. Other Separable Image Transforms: Walsh Transforms, Discrete Cosine Transform, Hadamard Transform, the Haar & Slant transform.
Study of basic functions of image processing toolbox of Matlab software

Reference Books –

1. Research in education, By J W Best and J V Kann. Pearson/ Allyn and Bacon.
2. Research Methodology - Methods and Techniques, C K Kothari, New Age International.

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3. Solar Photovoltaic's: Fundamentals, Technologies and Applications, C. S. Solanki, 2nd Edition, Prentice Hall of India, 2011.
4. Solar cells: Operating principles, technology and system applications, by Martin A. Green, Prentice-Hall Inc, Englewood Cliffs, NJ, USA,
5. Physics of Solar Cells: From Basic Principles to Advanced Concepts Peter Würfe Wiley-VCH; 1 edition
6. Organic Electronics: Materials, Manufacturing, and Applications Hagen Klauk Wiley-VCH; 1 edition
7. Organic Molecular Solids Markus Schwoerer (Author), Hans Christoph Wolf, Wiley-VCH; 1 edition (March 27, 2007)
8. Semiconductor Devices Modeling and Technology" by Nandita Das Gupta and Amitava Das Gupta, Prentice Hall of India Pvt.Ltd.
9. Digital Image Processing : Gonzalez and Woods, 2nd Edition, Pearson Education Publication
10. Fundamental of Digital Image Processing - A.K.Jain, PHI.

Paper – II

Review of Literature in Concerned Subject, Seminar/ Project Report

Review work related to latest developments in any related field excluding Ph.D. thesis topics.

The student should submit a detailed report of the review work and deliver a seminar before

submission of the report and one final seminar.

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