GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY
Sector – 16C Dwarka, New Delhi – 110078
(Coordination Branch)

F.No. IPU/JR(C)/44th AC/2018/454 Dated:04/07/2018

Circular

The 44th meeting of the Academic Council of the University was held on 03/05/2018. Please find enclose herewith the proceedings of the 44th meeting of the Academic Council for kind information.

(Registrar)
coordination112@gmail.com

F.No. IPU/JR(C)/44th AC /2018/ Dated:04/07/2018

1) All Deans and Directors of Guru Gobind Singh Indraprastha University
2) Prof. Sanjiv Mittal, Professor, University School of Management Studies
3) Prof. U.K. Mandal, Professor, University School of Chemical Technology
4) Prof. Udayan Ghose, Professor, University School of Information Communication & Technology
5) Dr. Nimisha Sharma, Associate Professor University School of Biotechnology
6) Dr. Gulshan Kumar, Asst. Professor, University School of Basic and Applied Science.

Copy for kind information of the competent authority:
(i) AR to the Vice Chancellor GGSIP University
(ii) SO to the Pro-Vice Chancellor GGSIP University
(iii) AR to the Registrar GGSIP University

(Registrar)
coordination112@gmail.com

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

SECTOR – 16 C, DWARKA, NEW DELHI - 110078

GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY

FORTY FOURTH MEETING OF THE ACADEMIC COUNCIL

DATE : 03rd May, 2018 (Thursday)

TIME : 03.30 P.M. Onwards

VENUE: (Conference hall, Vice Chancellor's Secretariat)

PROCEEDINGS OF 44th ACADEMIC COUNCIL MEETING

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01	AC44.01	To confirm the minutes of 43rd meeting of the Academic Council held on 25/05/2017.	08
02	AC44.02	To consider and approve the Action taken report on the proceedings of 43rd meeting of the Academic Council held on 25/05/2017.	08
03	AC44.03	To consider and approve the Scheme and Syllabus of Bachelors in Hotel Management and Catering Technology, to be implemented from the Academic Session 2018-2019.	08
04	AC44.04	To ratify the revised Scheme of Examination and Syllabus for, BBA, BBA (B&I), B.Com(Hons), implemented from the Academic Session 2017-2018.	08
05	AC44.05	To ratify the minor revision(Inclusion of Course in GST) in the Courses: BBA(G),BBA(B&I),BBA(TTM), B.COM(H) and all undergraduate and Post Graduate Courses offered by University School of Management Studies, implemented from the Academic Session 2017-2018.	09
06	AC44.06	To ratify the Course Work for Ph.D. programme offered by University School of Management Studies, implemented from the Academic Session 2017-2018.	09
07	AC44.07	To ratify the Syllabus, Course content and Scheme of Examination of the M.Phil. (English), 2 Semesters (one year) duration Course, implemented from the Academic Session 2017-2018.	09
08	AC44.08	To ratify the revision of Ph.D. Course work, the Course content and Scheme of examination for Ph.D. course in English, offered by University School of Humanities and Social Sciences, implemented from the Academic Session 2017-2018.	10
09	AC44.09	To consider and approve the Course content for 3rd & 4th Semester of B.A Economics (Hons) (three year) programme to be implemented from the Academic Session 2018-2019.	10

10	AC44.10	To ratify (i)Syllabus of M.Tech. (Bio Chemical Engg.) for B.Tech./M.Tech.(Bio-Chemical Engineering/Dual Degree Programme (ii) minor modification of Chemical Engg. Courses, being taught at the University School of Biotechnology for B.Tech. (Biotechnology) students, implemented from the Academic Session 2017-2018.	11
11	AC44.11	To consider and approve the harmonization of evaluation structure of LLM (Regular) programme, offered by University School of Law and Legal Studies in accordance with existing norms of Ordinance -11 of the University.	11
12	AC44.12	To consider and approve the harmonization of the Paper Code and Paper ID of Subjects being taught in LLM programme of One year duration offered by University School of Law and Legal Studies.	11
13	AC44.13	To consider and approve the Syllabus, Curriculum, Evaluation Scheme, CET Syllabus and Eligibility Criteria for, Post Basic B.Sc. Nursing Programme to be implemented from the Academic Session 2018-2019.	12
14	AC44.14	To ratify the change in Curriculum of M.Phil. Clinical Psychology programme, implemented from the Academic Session 2017-2018.	12
15	AC44.15	To ratify the minor modification of Ph.D. Course work, offered by University School of Biotechnology, implemented from the Academic Session 2017-2018.	13
16	AC44.16	To ratify the Scheme of Examination and syllabi of Ph.D. Course work, offered by University School of Basic and Applied Sciences, implemented from the Academic Session 2017-2018.	13
17	AC44.17	To ratify the Ph.D. course work, offered by University School of Environment Management, implemented from the Academic Session 2017-2018.	13
18	AC44.18	To consider and approve the recommendations with respect to the grievance of B.Tech. programme students for mandatory papers.	14
19	AC44.19	To ratify the Admission Brochure of the University for the Academic Session 2018-19, Part-A containing details of various Programmes being offered, CET form filling Procedure, CET (s) to be conducted, eligibility conditions, syllabus of CET (s), Counselling Procedures etc., Part-B containing various Appendices, Part-C Counselling Schedule Summary and Part-D Refund Policy .	14

20	AC44.20	To consider and approve the Course outline and Scheme of Examination and detailed Course content of the three year Bachelor of Arts (Honours) English Programme to be implemented from the Academic Session 2018-2019 in various affiliated institutions of the University.	14-15
21	AC44.21	To consider and approve the adoption of the University Grants Commission (Minimum Qualifications for Appointment of Teachers and other Academic Staff in the Universities and colleges and measures for the Maintenance of Standards in Higher Education)(4th Amendment),Regulations,2016 ,notified vide the University Grants Commission notification no.F1-/2016 (PS/Amendment), New Delhi, dated 11th July,2016.	15
22	AC44.22	To consider and approve the Ph.D. Course work offered at University School Information Communication & Technology from the Academic Session 2018-2019 onwards.	15
23	AC44.23	To ratify the Ph.D. Course work offered at University School Information Communication & Technology from the Academic Session 2017-2018 onwards.	15
24	AC44.24	To consider and approve number of credits for the award of B.Voc Printing Technology.	16
25	AC44.25	To consider and approve the change in subject codes of the subjects named as (a) Data Communication and Networks (6th Semester Instrumental and Control Engg) from ETEC 310 - ETIC -312 applicable for batch 2015-2016 onwards for B.Tech. in Affiliated Institutions.	16
26	AC44.26	To consider and approve the suggestions regarding issue of Diploma, Advance Diploma and B. Voc as deliberated by the committee under the chairmanship of Controller of Examinations (O).	16
27	AC44.27	To consider and approve (i) Introduction of two new electives on basic and advanced entrepreneurship as a part of the M.Tech.(Biotechnology) Scheme and curriculum 2016, to be implemented from the Academic Session 2018-2019. (ii) The minor corrections in the course codes as incorporated in the B.Tech.(Biotechnology) Curriculum (2016 scheme) in the subjects taught by the University School of Basic & Applied Sciences as per the original course codes approved by the Board of School of Studies of USBAS.(The remaining scheme and course contents shall remain the same).	17

28	AC44.28	**To consider and approve the revised Course Content, (Syllabus) of MBA (Disaster Management) Weekend Programme, offered by Centre for Disaster Management Studies, to be implemented from Academic Session 2018-2019 onwards.**	17
29	AC44.29	**To co-opt maximum 10 expert members for their special knowledge as per the provisions of Statute 11 Sub-Section (viii) of Section (1) of the Guru Gobind Singh Indraprastha University Act to be members of the Academic Council.**	18
30	AC44.30	**To consider and approve the regulations under Ordinance 12 for programmes leading to the Degree of Doctor of Philosophy (Ph.D.)**	18

Agenda Item No. AC44.15:To ratify the minor modification of Ph.D. Course work, offered by University School of Biotechnology, implemented from the Academic Session 2017-2018.

The Academic Council noted that in accordance to the revised Ph.D Ordinance12 (2017) in the University, the Ph.D course work is made at par with the overall curriculum framework of the University (lecture+ tutorials). The overall credits increased from 3 to 4. This is the minor modification as the rest of scheme and the course titles and contents for the Ph.D course work essentially remain same.

The Academic Council ratified the minor modification of Ph.D. course work, offered by University School of Biotechnology, implemented from the Academic Session 2017-2018.

The ratified minor modification of Ph.D. course work is annexed as Annexure–XII,page(XII-01 to XII-06).

Agenda Item No. AC44.16:To ratify the Scheme of Examination and Syllabi of Ph.D. Course work, offered by University School of Basic and Applied Sciences, implemented from the Academic Session 2017-2018.

The Academic Council noted that in accordance to the revised Ph.D Ordinance12 (2017) in the University, the Ph.D course work is made at par with the overall curriculum framework of the University (lecture+ tutorials). The overall credits increased from 3 to 4. This is the minor modification as the rest of scheme and the course titles and contents for the Ph.D course work essentially remain same.

The Academic Council ratified the Scheme of Examination and Syllabi of Ph.D. Course work, offered the University School of Basic and Applied Sciences, implemented from the Academic Session 2017-2018.

The ratified Scheme of Examination and Syllabi of Ph.D. Course work is annexed as Annexure –XIII ,page (XIII-01).

Agenda Item No. AC44.17: To ratify the Ph.D. course work, offered by University School of Environment Management, implemented from the Academic Session 2017-2018.

The Academic Council noted that in accordance to the revised Ph.D Ordinance12 (2017) in the University, the Ph.D course work is made at par with the overall curriculum framework of the University (lecture+ tutorials). The overall credits increased from 3 to 4. This is the minor modification as the rest of scheme and the course titles and contents for the Ph.D course work essentially remain same.

The Academic Council ratified the Ph.D. Course work offered by the University School of Environment Management, implemented from the Academic Session 2017-2018.

The ratified the Ph.D. Course work is annexed as Annexure –XIV,page (XIV-01).

University School of Basic &Applied Sciences

Guru Gobind Singh Indraprastha University

Scheme and Syllabus for PhD Programmes

In

Physics

Scheme and Syllabi

2017-onwards

Entrepreneurship | Employability | Skill Development

Approved in the 44th meeting of the Academic Council held on 03-05-2018 vide agenda item 44.16 w.e.f. 2017

PROGRAMME OUTCOMES

(Ph.D. in PHYSICS PROGRAMMES)

PO1KNOWLEDGE, CRITICAL AND CREATIVE THINKING: The student will develop the skills for acquiring the right knowledge, skills and critical and creative ways of approaching and carrying out research

PO2 UNDERSTANDING, GATHERING AND REVIEWING INFORMATION AND DATA: The student will develop a thorough knowledge of literature review and a comprehensive understanding of methods and techniques applicable to their own research

PO3 THE ABILITY TO CARRY OUT ORIGINAL AND INDEPENDENT RESEARCH: The student will learn to apply advanced and specialized skills and be able to act independently in the planning and implementation of research

PO4 COMMUNICATION AND LEADERSHIP SKILLS: Students participate in seminars, research group meetings, competitions, conference talks, poster presentations, and teaching, and learn to communicate effectively. They also learn leadership through communication and working effectively with others and professional conduct that are needed for the effective management of research.

PROGRAMME SPECIFIC OUTCOMES

The Ph.D.Programs in Physics, Chemistry and Mathematics deal with areas of research that are specializations of the Faculty of the school which could be experimental or theoretical.

PHYSICS

PSO1: Learning to present the problem in the context of the particular research area in Physics and the work done globally. Detailing the aspects of the system, the models, the experimental/theoretical approach and methodology. Having clarity on all basic concepts.

PSO2: Developing problem solving and experimental techniques in Physics like modelling, simulation, analytical methods, instrumentation, sample preparation, characterisation, computational techniques, visualization in the particular area of Physics research

PSO3: Learning to interpret and communicate results effectively. Learning to write a manuscript clearly and professionally and being familiar with all aspects of publishing

CHEMISTRY

PSO1: Learning to present the problem in the context of the particular research area in chemistry and the work done globally. Detailing the aspects of the system, the models, the experimental/theoretical approach and methodology. Having clarity on all basic concepts.

PSO2: Developing problem solving and experimental techniques in chemistry like synthesis, analysis, instrumentation, sample preparation, characterization, computational techniques, visualization in the particular area of chemistry research

PSO3: Learning to interpret and communicate results effectively. Learning to write a manuscript clearly and professionally and being familiar with all aspects of publishing

MATHEMATICS

PSO1: Learning to present the problem in the context of the particular research area in mathematics and the work done globally. Detailing the aspects of the system, the models, the experimental/theoretical approach and methodology. Having clarity on all basic concepts.

PSO2: Developing problem solving a techniques in mathematics, numerical and computational techniques, statistical analysis, visualization in the particular area of mathematics research

PSO3: Learning to interpret and communicate results effectively. Learning to write a manuscript clearly and professionally and being familiar with all aspects of publishing

MAPPING BETWEEN PROGRAMME OUTCOMES AND PROGRAMME SPECIFIC OUTCOMES			
PO/PSO	**PSO1**	**PSO2**	**PSO3**
PO1	**5**	**7**	**5**
PO2	**6**	**8**	**9**
PO3	**4**	**5**	**9**
PO4	**3**	**7**	**8**

SCHEME AND SYLLABUS
for
DOCTOR IN PHILOSOPHY
In
PHYSICS

S. No.	Code	Paper	L	P	Credits
1.	CWP – 101	Research Methodology for Science & Technology	4	0	4
2.	CWP – 102	Research and Publication Ethics	2	0	2
Elective (Chose atleast One)					
3.	CWP – 103	Introduction to MATLAB and Computational Methods	2	0	2
4.	CWP – 104	MATLAB and Computational Method Lab	0	2	2
5.	CWP – 105	Advanced Characterization Techniques	4	0	4
6.	CWP – 106	Solar Radiation and Solar Photovoltaic Science and Engineering	4	0	4

Paper Code: CWP - 101	Paper: RESEARCH METHODOLOGY FOR SCIENCE & TECHNOLOGY	L	T/P	C
Paper ID:		3	1/0	4

Marking Scheme:

- Teachers Continuous Evaluation: 25 marks
- End Term Theory Examinations: 75 marks

Course Objectives:

1:	To expose the scholars for some details associated with the theoretical and experimental research in the different branches of sciences and the technologies involved.
2:	Learn methods to devise and design a research set-up
3:	Planning their research career
4:	Conclude research in report writing and meaningful interpretation

Course Outcomes (CO):

CO1:	Students will learn basic concepts of research and importance.
CO2:	Collect data through experiments or survey as per research requirement.
CO3:	Develop understanding on various kinds of research, objectives of doing research, research process
CO4:	Write research report, research proposal with proper citations.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (Scale 1: low, 2: Medium, 3: High)

CO/PO	PO1	PO2	PO3	PO4
CO1	3	3	3	3
CO2	2	3	2	1
CO3	3	2	3	3
CO4	3	3	2	3

UNIT-I

Basic concepts in Scientific approach to research: Definition, motivation & significance of research, types of research, research process and steps in conducting research; Planning researchProblem identification and formulation; Research design; Application of Research scenario in India.

UNIT-II

Literature survey and Report writing: Review of the publisher research in the relevant field; Re-viewing literature; Report Preparation, Structure of Report, Report Writing Skills, Citations, Research Papers,; formulation of research projects proposal; Types of reports, bibliography.

UNIT-III

Research Ethics & Plagiarism: Values, standards & practices; scientific misconduct; human participants & animal subjects, authorship allocation of credit, competing interests, commitments & values. Definition, types of plagiarism, unintentional plagiarism, mechanisms for avoiding plagiarism.

UNIT-IV

Invention, Innovation, IPR: Understanding of invention & innovation and its role in economic development; patents & copyrights, importance &basic knowledge of Intellectual Property Right (IPR); what can and cannot be protected.

Note: *In the backdrop of the above, the assignments may be in the context of the chosen research field of the scholar, and may be designed to facilitate in identity the topic and in the process of Synopsis preparation for their respective proposed research. The work out format for the assignments must be intensively participatory; may be conducted by way of presentations and participative discussions in cl*

SUGGESTED REFERENCES

1. Research Methodology Methods and Techniquest - C.R. Kothari, New Age Intl. Pub. (2004)
2. Business Statistics for contemporary decision making- Ken Black, John Wiley and Sons, Inc. 2010.
3. Research Methodology (Concept and Cases)-Deepak Chawla &NeenaSodhi, Vikas Publication House (P) Ltd. (2011)
4. Research Methodology- DebashisChokarvaty, Surbhi (P) Ltd. (2010)
5. Research Methodology-Navin Sharma, Deep & Deep (P) Ltd. (2007)
6. Research Methodology -Ranjit Kumar, Delhi Pearson Education (2006)
7. "The Role of Invention, Innovation and The Industrial Property System in Economic Development", www.wipo.int/cdocs/mdocs/innovation/en/.../wipo_inn_cai_97_1.doc
8. MLA Handbook for Writers of Research Papes- Joseph Gibaldi, New Delhi, Affiliated East West Press (1999 15th edition).

Paper Code: CWC – 102	Paper: Research Values and Ethics	L	T/P	C
Paper ID:		2		NUES

Marking Scheme:

1. Teachers Continuous Evaluation: marks
2. Term end Theory Examinations: marks

Course Objectives:

1:	To develop a universal approach towards human values
2:	To be able to strike a balance between aspirations and happiness
3:	To understand that humans are a part of nature and how being close to nature bring in joy and satisfaction
4:	Select classical short stories from Indian context will expose the students to diverse and multifaceted subsections in Indian society

Course Outcomes (CO):

CO1:	The students will get sensitized about the role of value education and learn to balance ambition & happiness
CO2:	The students will be able to understand the importance of living in harmony with nature
CO3:	The students will be able to see the relevance of Professional behavior and ethics
CO4:	They will draw inspiration from the classical Indian literature narrated to them in the form of select short stories

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (Scale 1: low, 2: Medium, 3: High)

CO/PO	PO1	PO2	PO3	PO4
CO1	3	1	3	3
CO2	3	2	2	2
CO3	2	3	2	3
CO4	2	3	3	2

Unit I

The Problem and Paradox of Happiness:Twin goals: happiness and just order; role of value education. Concept of good life-quality of life and subjective well-being; happiness, life satisfaction and positive affect; studying quality of life through surveys; and findings of quality of life surveys. Moral and Institutional approaches; and the inherent conflict between the two. Man and Society

Unit II

Happiness and Nature: Biophilia hypothesis- connections with nature and co-existence with other forms of life, Deep Ecology, Importance of meaningful contact with the natural world, solutions for a healthier, greener tomorrow, Indigenous and traditional knowledge system and its intellectual roots.

Unit III

Basics of Professional Ethics, Ethical Human Conduct:Human Conduct- based on acceptance of basics Human Values, Humanistic Constitution and Universal Human Order-skills, sincerity and fidelity. To identify the scope and characteristics of people-friendly and eco-friendly production systems.

Unit IV

Encompassing Different Stories/ narratives on Human Values from Indian Context.

Suggested Readings and References

1. Gaur, R.R., Sangal, S.andBagaria, G., "A Foundation Course in Human Values and Professional Ethics", New Delhi: Excel Books, 2010.
2. Mike, W. Martin, "Paradoxes of Happiness", Journal of Happiness Studies, 2008, pp. 171-184.
3. Giddens, Anthony, "Sociology", 5th edition, Cambridge: Polity Press, 2006.
4. Ambedkar, B.R., Buddha and his dhamma, http://www.scrubd.com/doc/16634512/Buddha-and-His-Dhamma-by-B-R-Ambedkar-Full [accessed on 21 October, 2010]
5. Beteille Andre, "Antinomies of Society: Essays on Ideologies & Institutions", New Delhi: Oxford University Press, 2000.
6. FikretBerkes, "Sacred Ecology", Second Edition Routledge Taylor & Francis Group, 2008.
7. Richard Louv, "Last Child in the Woods", Algonquin Books, 2008.
8. Ramakrishnan, E.V., "Indian Short Stories": (18700-200). SahityaAkademi, 2012.
9. Davidar, David., "Cluch of Indian Masterpieces", Aleph Book Company, 2016.

"Contemporary Indian Short Stories", SahityaAkademi, 2014.

Paper Code: CWM - 103	Paper: Introduction to MATLAB and Computational Methods	L	T/P	C
Paper ID:		**2**	**-**	**2**

Marking Scheme:

- Teachers Continuous Evaluation: 25 marks
- Term end Theory Examinations: 75 marks

Course Objectives:

1:	Introduce the students from diverse backgrounds to the importance of computational techniques and to expand their mathematical skills in areas of numerical methods.
2:	Introduce and train students in computational methods with MATLAB as the programming language
3:	Expose students to introductory topics and the basics of numerical techniques and programming. Problems are selected from a list which is updated from time to time in tune with the needs of industry/research and topical subjects.
4:	Educate students to learn the logic behind solving problems related to real physical examples, simulation, modelling and designing the algorithms and translating them into programmes

Course Outcomes (CO):

CO1:	The students are expected to develop the flavour of modelling and simulation.
CO2:	To generate working knowledge of MATLAB.
CO3:	To gain working knowledge of Monte Carlo methods, Time series analysis method for application to real life problems.
CO4:	To solve some famous and advanced problems in Physics using simulation.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (Scale 1: low, 2: Medium, 3: High)

CO/PO	PO1	PO2	PO3	PO4
CO1	3	3	2	2
CO2	3	2	3	2
CO3	2	3	3	3
CO4	2	3	3	3

UNIT-I

Introduction to the MATLAB programming language: Operations in MATLAB: basic mathematical operations with matrices, arrays, etc. Plotting with MATLAB: line plots, 1-D, 2-D, 3-D, meshgrid, labelling axes, legends, importing and plotting data files in MATLAB; Root finding and curve fitting.

UNIT-II

Numerical methods for solving ordinary differential equations: The Euler method, Programming in MATLAB to solve 1st order and 2nd order ODEs by Euler method, Solving ODEs using inbuilt MATLAB solvers

UNIT-III

Numerical methods for Integration: Rectangular, Trapezoidal, Simpson methods
Using direct MATLAB solvers for integration, Introduction to Monte Carlo methods: Random numbers, Monte Carlo Integration. Some examples from linear algebra and matrices; Fractals, polynomial fit and exponential fit.

UNIT-IV

Time Series Analysis Methods: Stationary processes, Lag plots, Auto correlation function, Power spectral density.

References

1. Rudra Pratap, Getting started with MATLAB [Oxford University Press]
2. Chapman, Essentials of MATLAB Programming
3. Balagurusamy, Numerical Methods [Tata McGraw Hill]
4. Tao Pang, An introduction to Computational Physics [Cambridge University Press]
5. Andi Klein and Alexander Godunov, Introductory Computational Physics [Cambridge University Press]
6. Ward Cheney and David Kincaid, Numerical Methods and Computing
7. AlfioQuarteroni and FaustoSaleri, Scientific Computing with MATLAB and Octave
8. S. R. Otto and J. P. Denier, An Introduction to Programming and Numerical Methods in MATLAB

Paper Code: CWM - 104	Paper: MATLAB and Computational Methods Lab	L	T/P	C
Paper ID:		**0**	**2**	**2**

Marking Scheme:

- Teachers Continuous Evaluation: 25 marks
- Term end Theory Examinations: 75 marks

Course Objectives:

1:	Introduce the students from diverse backgrounds to the importance of computational techniques and to expand their mathematical skills in areas of numerical methods. Introduce the concepts and theory of various simple problems and algorithms that can be subsequently applied to programming in MATLAB to solve then in the Lab**.**
2:	Introduce and hands on training of students in computational methods with MATLAB as the programming language
3:	Problems are selected from a list which is updated from time to time in tune with the needs of industry/research and topical subjects.
4:	Educate students to learn the logic behind solving problems related to real physical examples, simulation, modelling and designing the algorithms and translating them into programmes

Course Outcomes (CO):

CO1:	Studentswillbe able to programme themathematical concepts they have learned.
CO2:	Theywill gain practical MATLAB knowledge.
CO3:	Theywillbe able to use simulation to tackle severalwell-known and sophisticatedPhysicsproblemsthatwouldotherwisebedifficult to addressanalytically.
CO4:	The studentsshould gain an understanding of modelling and simulation.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (Scale 1: low, 2: Medium, 3: High)

CO/PO	PO1	PO2	PO3	PO4
CO1	3	3	3	2
CO2	2	3	3	1
CO3	3	2	2	3
CO4	3	1	2	3

UNIT-I

Plotting

(a) Eigenvalues & Eigenfunctions for Particle in a Box – 1D & 2D;
(b) Hydrogen atom wave functions

UNIT-II

ODE's – examples-

(a) Simple, damped and driven Harmonic Oscillator;
(b) Van der Pol Oscillator;
(c) Radioactive Decay;
(d) LCR Circuit;
(e) Schrodinger equation in 1D;
(f) Coupled ODEs – The Lorenz Equations;
(g) Calculation of Eigen functions (π molecular orbitals using HMO theory);
(h) Kinetics of oscillatory reactions.;

UNIT-III

Monte Carlo methods

(a) Simulate coin toss, die roll etc. using MATLAB's inbuilt commands;
(b) Estimating the value of "pi" using random numbers on a circle & sphere;
(c) Monte Carlo Integration

UNIT-IV

Time Series Analysis Methods: Stationary Processes, Lag Plots, AutoCo-relation Function, Power Spectral Density

This list may be updates/modified to included related application from time to time

Assignments may be designed relevant to the broad area of research of the research scholar.

References

1. Rudra Pratap: Getting started with MATLAB [Oxford University Press]
2. Chapman: Essentials of MATLAB Programming
3. Tao Pang: An introduction to Computational Physics [Cambridge University Press]
4. Andi Klein and Alexander Godunov: Introductory Computational Physics [Cambridge University Press]
5. Ward Cheney and David Kincaid: Numerical Methods and Computing
6. AlfioQuarteroni and FaustoSaleri: Scientific Computing with MATLAB and Octave
7. S.R. Otto and J.P Denier An Introduction to Programming and Numerical Methods in MATLAB.

Paper Code: CWP - 105	Paper: Advanced Characterization Techniques	L	T/P	C
Paper ID:		4	-	4

Marking Scheme:

- Teachers Continuous Evaluation: 25 marks
- Term end Theory Examinations: 75 marks

Course Objectives:

1:	To understand the basic concepts of Instruments and utility of the XRD,SEM and TEM
2:	Students are expected to learn the state of art of science and power of Technology to study their experimental research work.
3:	know the interaction of electromagnetic radiation with matter with respect to NMR, IR and UV spectroscopy to identify the molecules.
4:	To understand the General Principle, Instrumentation and Applications of Photoluminescence Spectroscopy, Raman Spectroscopy,ElectronSpin Resonance, Thermogravimetric Analysis (TGA) and Differential Scanning Calorimetry (DSC)

Course Outcomes (CO):

CO1:	The end of the course the students are able to acquire enough knowledge to analyse their experimental results.
CO2:	This course will help to understand and analyse their experimental results in specific to structural, morphology, chemical analysis and transport mechanism
CO3:	The students will understand instrumentation and application of spectroscopic techniques like: NMR, IR, UV, and will be able to elucidate the structure of molecules
CO4:	dents will understand instrumentation and application ofPhotoluminescence Spectroscopy, Raman Spectroscopy, ElectronSpin Resonance, Thermogravimetric Analysis (TGA) and Differential Scanning Calorimetry (DSC) which they can use that during theirresearch studies.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (Scale 1: low, 2: Medium, 3: High)

CO/PO	PO1	PO2	PO3	PO4
CO1	3	2	3	3
CO2	2	3	3	3
CO3	3	2	3	2
CO4	3	3	2	3

UNIT-I

Structural Characterization:

Electron Microscopy- SEM, TEM, EDAX.

X-ray Diffraction and Electron diffraction, Atomic Force Microscopy, Scanning Tunneling Microscopy

UNIT-II

Transport Characterization: Electrical Conductivity, Seebeck Coefficient, Thermal Conductivity, Techniques for measurements of Hall effect, AC and DC conductivity, AC impedence spectroscopy for analysis of conducting behaviour of materials.

UNIT-III

UV-Visible spectroscopy, Photoluminescence spectroscopy, IR spectroscopy- Fourier Transform Infrared Spectroscopy (FTIR) and Attenuated Total Reflection Spectroscopy (ATR), Raman spectroscopy, Nuclear magnetic resonance, electron spin resonance.

References

1. Element of X-ray diffraction, BD Cullity and SR Stock, 2001, Pearson.
2. Electron Microscopy: Principles and Fundamentals, Edited by : S. Amelinckx, Dirk vanDyck, Gustaaf van Tendeloo, J. Van Landuyt,2008, John Wiley & Sons.
3. An Introduction to Surface Analysis,John F. Watts,John Wolstenholme, 2003, Wiley.
4. ASM Hand Book Volume 10- Material Characterization, Edited by :Thomas J. Bruno,RyanDeacon,Jeffrey A. Jansen,NealMagdefrau,ErikMueller,George F. Vander Voort,Dehua Yang,2019, ASM International.
5. Organic Spectroscopy, William Kemp, 1991, Palgrave, London.
6. Thermal Analysis, Wendlandt, Wesley William, 1986, Wiley-Interscience. New York.

Paper Code: CWP – 106	Paper: Solar radiation and Solar Photovoltaic Science and Engineering	L	T/P	C
Paper ID:		4	-	4

Marking Scheme:

- Teachers Continuous Evaluation: 25 marks
- Term end Theory Examinations: 75 marks

Course Objectives:

1:	To have an overview about the status, recent trends and future scope of solar energy in general and solar photovoltaic in particular.
2:	Designing of a Photovoltaic system
3:	To be aware of recent research trends and emerging technologies in Photovoltaic.
4:	To understand concepts of solar radiation

Course Outcomes (CO):

CO1:	Explain the existing solar energy potential.
CO2:	Explain the operation and performance of solar Photovoltaic system
CO3:	Perform a solar resource assessment of a potential site and develop understanding on the Photovoltaic plant design.
CO4:	Have sufficient knowledge of recent trends and emerging technologies in solar Photovoltaic.

Course Outcomes (CO) to Program Outcomes (PO) Mapping (Scale 1: low, 2: Medium, 3: High)

CO/PO	PO1	PO2	PO3	PO4
CO1	**1**	**3**	**3**	**3**
CO2	**3**	**3**	**2**	**2**
CO3	**3**	**3**	**2**	**3**
CO4	**1**	**3**	**3**	**3**

Unit I:

Introduction:Current energy scenario and importance of renewable energy in general and solar energy in particular, Solar radiation, usefulness of radiation data for solar engineers, designers and architects. Sun-Earth relations, Thermal radiation, Extra-terrestrial Solar Radiation, Interaction of Solar radiation with atmosphere, various scattering, absorption and reflection processes, Terrestrial Solar Radiation, radiation data from satellite, Solar radiation measuring instruments: Pyranometer, Pyrheliometer, sun shine recorder etc., hourly global, beam and diffuse radiation, estimation of global radiation on horizontal surface, importance of radiation data for modelling of devices and simulations

Unit II :

Status, Trends, Challenges and the future scope of Solar photovoltaics: What is photovoltaics, history, goals of todays PV research, global trends, motivation for photovoltaic application and development, crystalline Silicon technology, progress and challenges, Physics of solar cell: fundamental properties of semiconductors, pn junction diode electrostatics, solar cell fundamentals, spectral response, theoretical limits of photovoltaic conversion, V-I characteristics of solar cell, properties of efficient solar cells PV cell, module, Array, Energy storage, study of associated system electronic components in brief like charge controller, battery, inverter, wiring, stand etc.

Unit III:

PV System Designing: Designing, modelling and simulation of standalone PV Systems, Designing, modelling and simulation of PV,hybrid systems, utility interactive system.

Unit IV:

Emerging PV Technologies and their future: Dye sensitized solar cell, other variants of Dye Sensitized solar cells, Perovskite solar cell, organic solar cell and other emerging technologies in solar photovoltaics.

References

1. Solar Energy: Fundamentals, design, Modelling and Applications, G.N. Tiwari,2002, Narosa Publishing house
2. Understanding renewable energy systems, Volker Quaschning, 2006, Replika Press Pvt. Ltd., India.
3. Alternative Energy, Vol 1-3, Neil Schlager and Jayne weisblatt, 2006
4. Thompson Gale Generating electricity from the sun, Fred C Treble,1991, Pergramon Press
5. Solar Cells: Operating principles, technology and system Applications, Martin A. Green, 1982, Prentice Hall
6. Physics of solar cells, Peter Wurfel, 2016, Wiley VCH Verlag GmbH & Co. KGaA
7. Terrestrial solar photovoltaics, Tapan Bhattacharya, 1998, Narosa Publishing House