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

INDEX OF PROCEEDINGS

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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

Chemistry

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 CHEMISTRY PROGRAMMES)

PO1KNOWLEDGE, CRITICAL AND CREATIVE THINKING: The student will develop the skills for acquiring the right knowledge, skills and 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 specialised skills and be able to act independently in the planning and implementation of research

PO4COMMUNICATION 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 PhD Programmes 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.

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, characterisation, computational techniques, visualisationetc 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

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
CHEMISTRY

S. No.	Code	Paper	L	P	Credits
1.	**CWC – 101**	Research Methodology for Science & Technology	3	1	4
2.	**CWC – 102**	Research and Publication Ethics	2	0	2
Elective (Choose atleast One)					
3.	**CWC – 103**	Introduction to MATLAB and Computational Methods	2	0	2
4.	**CWC – 104**	MATLAB and Computational Method Lab	0	2	2
	CWC – 105	Nano structured thermoelectric materials	4	0	4
	CWC – 106	Advanced Characterization Techniques	4	0	4
5.	**CWC – 107**	Heterocyclic Chemistry & Synthon Approach	4	0	4
	CWC – 108	Biological Chemistry	4	0	4
	CWC – 109	Natural Products and Instrumentation	4	0	4

Paper Code: CWC – 101	Paper: RESEARCH METHODOLOGY FOR SCIENCE & TECHNOLOGY	L	T/P	C
Paper ID:		**3**	**1**	**4**

Marking Scheme:

- Teachers Continuous Evaluation: --25 Marks
- Term end 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: 25 marks
2. Term end Theory Examinations: 75 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: CWC - 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 physics / chemistry problems 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: CWC - 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

Instructions for paper setter:

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:	Studentswill have a workingunderstanding of the mathematicalskillsneeded for programming.
CO2:	Theywillgenerateworkingknowledge of MATLAB.
CO3:	Theywillbe able to solvesomefamous and advancedphysicsproblemsusing simulation which are otherwisedifficult to solveanalytically.
CO4:	The students are expected to develop the flavour 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 – exmples-

(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 mthods (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: CWC - 105	Paper: Nanostructured Thermoelectric Materials	L	T/P	C
Paper ID:		4	-	4

Marking Scheme:

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

Course Objectives:

1:	Nanostructured Thermoelectric Materialsis currently one of the hottest topicsin the energy sector, physics & engineering, expected to revolutionize the future demand for renewable energy.
2:	urse demands an experimental science and will introduce students to this exciting new field and cover its main ideas, current developments, and future trends.
3:	oduce students to the basic concepts in transport properties and to familiarize them with its unique development of good thermoelectric materials and applications which form a base for both working in upcoming companies as well as research groups in top IT companies and academia
4:	To educate students with the basics of electronic, phonon transport, the figure of merit, and thermoelectric device concepts, nanoscience concepts and decouple of thermoelectric properties. To introduce these concepts one can, visualize the various way to improve the thermoelectric properties and mechanism to fabricate the thermoelectric device.

Course Outcomes (CO):

CO1:	ıdent will be in a position to better understand the impact of this powerful discipline and be ready for the new frontiers opening up in the energy sector.
CO2:	The student will be familiar with the basic knowledge required to develop a new efficient thermoelectric material
CO3:	On completion of this course, the student will be ready for assignments and placement in the growing energy sector.
CO4:	The students will be able to start their start-ups to develop economically viable nano and micro thermoelectric devices for multiple applications.

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	2
CO2	1	3	2	1
CO3	3	3	2	3
CO4	2	3	2	3

UNIT-I

Electronic structure of material:

Statistical equilibrium of free electrons: density of states for bulk and low dimensional system, distributions: Maxwell Boltzmann, Fermi Dirac, carries concentration, impurity semiconductors, quantum wells, quantum wires and quantum dots.

UNIT-II

Static properties:

Specific heat of materials, thermionic emission

Transport properties of materials:

Boltzmann transport equation, particle diffusion, electrical and electronic thermal conductivity, Isothermal Hall effect Phonons, Lattice thermal conductivity Transport properties of quantum wells, quantum wires and nanocomposites.

UNIT-III

Thermo Electric Materials (TEM):

See beck coefficient, Peltier effect, Figure of merit, Selection of the material for TEM, Comparability parameter, Efficiency, Different types of TEM and recent development in low dimensional TEM, doping, alloying and size effects and its applications.

UNIT-IV

Thermoelectric module and device:

Introduction, Single mode and multi-mode devices, Segment thermoelectric model, Modelling and optimization of Segmented Thermoelectric Uncouples, Optimum Conversion Efficiency

References

1. Statistical physics: Patheria(Butterworth- Heinemann, Oxford, 1972)
2. Statistical physics: K.Huang(Wiley Eastern, New Delhi, 1975)
3. B.K.Aggarwal& Melvin Eisner : Statistical physics (Wiley Eastern, New Delhi)
4. CRC handbook of Thermoelectrics,Ed. CR Rowe, 1955

Paper Code: CWC - 106	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:	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:	Students 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: CWC – 107	Paper: Heterocyclic Chemistry& Synthon Approach	L	T/P	C
Paper ID:		4	-	4

Marking Scheme:

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

Course Objectives:

1:	It is aimed to skill students in designing the synthesis of important organic molecules
2:	Learning of synthesis and utility of various heterocyclic compounds
3:	Learning of application of organic reagents in a reaction
4:	To acquire knowledge on catalytic reactions

Course Outcomes (CO):

CO1:	Students shall able to design the synthesis of new organic molecules
CO2:	Gained knowledge on the synthesis of various heterocycles and to use further for designing new derivatives
CO3:	Utility of organic reagents in a reaction and can apply them in their research project
CO4:	Learnt how to use catalyst in a reaction

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

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

UNIT-I

Chemistry of Heterocyclic Compounds:

Introduction to Heterocycles: Nomenclature (Hantzsch Widman System), spectral characteristics, reactivity and aromaticity of monocyclic, fused and bridged heterocycles. Five and six-membered heterocycles with two or more hetero atoms: Synthesis, reactivity, aromatic character and importance of the following heterocycles: Pyrazole, Imidazole, Oxazole, Thiazole, Pyrimidine, Pyrazine, Oxazine, Thiazine, Triazoles, Oxadiazoles, Thiadiazoles, Triazines.

Synthesis and reactivity of Benzofuran, Benzothiophene, Benzopyrroles, Indole, Quinoline and Isoquinoline.

UNIT-II

Synthon Approach: Definition of terms-disconnection, synthon, functional group interconversion(FGI),Basic rules in Disconnection, Designing Organic Synthesis: rearrangement in synthesis, use of ketene in synthesis, aromatic heterocycles five member rings and synthesis of five and six member rings.

Use of synthon approach in the synthesis of following compounds: Terfenadine, Ibuprofen, Propanolol, Fentanyl, Ciprofloxacin, Diclofenac.

UNIT-III

Organometallic and Non-organometallic Reagents:

Preparation, properties and applications of the following in organic synthesis with mechanistic details: Lithium aluminium hydride, Lithium Diisopropylamide, Trimethylsilyl iodide, Diazomethane, Polyphosphoric acid, Dicyclohexylcarbodiimide, Lead Tetra-acetate, Osmium tetraoxide.

Organocopper Reagents, Organochromium Reagents, Organosilicon Reagents and Organo-nonmetallic Reagents.

UNIT-IV

Industrial Oxidizing and Reducing Agents: Reactions and mechanism of industrial Oxidizing agents: $KMnO_4$, $K_2Cr_2O_7$ and H_2O_2.
Reducing agents: Na_2SO_3 and $Na_2S_2O_3$.
Industrial Metals: Catalytic Reactions (hydrogenation, Zeigler Natta process, Wacker process and Fischer Tropsch process) of Raney nickel, Pd, Cr, V, Pt and Ti.

References:

1. Organometallics in J.M. Swan and D. organic synthesis C. Black, 1974, Champman and Hall
2. Designing of S. Warren organic synthesis, 1991, Wiley
3. Advanced Organic Jerry March chemistry, 6th edition, 2006, Wiley Eastern 4th edition
4. Some Modern W. Carruthers Methods of Organic Synthesis, 4th edition, 2005, Cambridge University Press
5. Advanced Organic Chemistry, Part B, F. A Carey and R.J. Sundeberg, 5th edition (2007) Springer

Paper Code: CWC - 108	Paper: Biological Chemistry	L	T/P	C
Paper ID:		4	-	4

Marking Scheme:

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

Course Objectives:

1:	ıstrate knowledge and understanding of the principles that govern the structures, functions and metabolism of macromolecules and their participation in molecular recognition
2:	ıstrate knowledge and understanding of the principles and basic instrumentation to separate and identify the macromolecules
3:	erstand the basic knowledge of enzymatic catalysis and its regulatory mechanism
4:	uire understanding of designing target oriented drug synthesis and their biological activity evaluation

Course Outcomes (CO):

CO1:	The students will understand the chemistry of carbohydrates, lipids, proteins and amino acids.
CO2:	The students will understand the principle and instrumentation of basic instruments used in separation of biomolecules
CO3:	The students will understand the mechanism of enzyme action & identify the classes of enzymes and regulation of metabolism.
CO4:	The students will understand the synthesis of bioactive molecules and their biological activity evaluation.

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	2
CO3	2	2	3	2
CO4	3	2	2	3

Unit-I

Introduction to Biomolecules: Amino Acids, Proteins, carbohydrates, Lipids and their metabolism. Protein modification: Enzymatic and non enzymatic.

Unit-II

Chromatography: Gas Chromatography and High Performance Liquid Chromatography-instrumentation, detectors and applications, Gel filtration, Ion Exchange chromatography, Affinity chromatography and Electrophoresis.

Unit-III

Enzymes: An Overview of Kinetics and Regulation, Biocatalysis Metabolic Pathways and their Regulatory Mechanisms.

Unit-IV

Synthesis of targetorienteddrugs and theirbiologicalactivityevaluation: Synthesis of differenttargetorientedmolecules and theirbiologicalactivities like antioxidant, antifungal, anticarcinogen, antimicrobial etc. evaluation.

Text/Reference Book:
1. Lehninger Principles of Biochemistry, Albert L. Lehninger , David L. Nelson, Michael M., 2004 Cox. 4th Edition. 2004. W H Freeman & Co. 2. Quantitative Chemical Analysis, Daniel C. Harris, 2006, 7th edition, 2006, W.H Freeman and Company. 3. Biochemistry, LubertStryer, 1995, 4th Edition. 1995,W H Freeman & Co.

Paper Code: CWC – 109	Paper: Natural Products and Instrumentation	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 learn basic knowledge of isolation and purification of natural molecules
2:	To study compounds produced by plants that have biological activity
3:	To learn identification of natural molecules with the help of spectroscopic techniques
4:	To enable students to compare natural molecule with synthetic molecule

Course Outcomes (CO):	
CO1:	It offers an excellent strategy towards identifying novel natural products
CO2:	The students will be able to discover bioactive molecules with special emphasis on developing 'Investigative New Drugs' (INDs)
CO3:	The students will be able to understand spectroscopic techniques [NMR, IR, UV, Mass etc] thoroughly
CO4:	The students will be able to modify natural product as per the need of the project.

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	2
CO2	2	3	3	3
CO3	3	2	3	2
CO4	3	2	2	3

Unit-I

Literature survey and identification of natural products

Unit-II

Characterization of Natural Products: Natural Product Chemistry and its importance in our life, Activity guided fractionation, isolation and characterization of leads from natural products spectroscopy.

Unit-III

Chromatography: Gas Chromatography and High Performance Liquid Chromatography- instrumentation, detectors and applications, TLC, Column chromatography, Gel filtration, Ion Exchange chromatography and Affinity chromatography and Electro- chromatography.

Unit-IV

Instrumentation: Nuclear Magnetic Resonance [NMR (^{1}H, ^{13}C)], Infra red (IR) spectroscopy, Ulta Violet (UV) spectroscopy, Mass. Spectrometry, Electrophoresis.

Text/Reference Book:

1. Organic Spectroscopy by William Kemp (1991)
2. **Spectrometric Identification of Organic Compounds** by Robert M. Silverstein, Francis X. Webster, and David Kiemle
3. Quantitative Chemical Analysis byDaniel C. Harris
4. Isolation, identification and characterization of allelochemical/natural products by Diego A. Sampietro, Cesar A. N. Catalan, Mark A. Vattuone (2009)
5. Introduction to organic Spectroscopy by Laurence M. Harwood (1996)