I.K. GUJRAL PUNJAB TECHNICAL UNIVERSITY

Estd. Under Punjab Technical University Act, 1996
(Punjab Act No. 1 of 1997)

Ref. No. : IKGPTU/Reg/N/ *Dated :*

NOTIFICATION

Sub: **Regarding Pre-Ph.D Course work.**

This is for information of all concerned that Pre-Ph.D course work from 2016-17 will be conducted in the IKGPTU main campus Kapurthala in regular mode. The PhD course work will consists of minimum 15 credits. The structure of the course work is as under.

Sr. No.	Nature of course	Name of course	Credits	Remarks
1.	Core	1.Research Methodology	4	The syllabus of RM should be formulated faculty wise such as Engineering, Science, Management/ Humanities and Life sciences
		2.Subject related theory paper	4	Discipline specific related to advancements in theoretical methods for research
		3. Presentation	3	Discipline specific
2.	Interdisciplinary	4. Elective	4	From list of subjects from allied fields
	Total Minimum credits		**15**	

-Sd-
Registrar

Endorsement No: IKGPTU/REG/N/ 4244-4251 Dated: 22.08.2016

1. Secretary to Vice Chancellor: For kind information of Vice Chancellor
2. Dean (P&D)
3. Dean (RIC)
4. Dean (Academics)
5. Finance Officer
6. Controller of Examination
7. DR (Computers): For uploading on website
8. File Copy

Registrar 22/8/16

I. K. Gujral Punjab Technical University, Jalandhar
Jalandhar Kapurthala Highway, Near Pushpa Gujral Science City, Kapurthala - 144 603
Ph. No. 01822 - 662521. 662501 Fax No. : 01822-255506. 662526. Email : registrar@ptu.ac.in

Annexure-A

01- Advanced Organic Chemistry

Total Hours: 45 **LTP-3-0-0**

1. **Pericyclic Reactions**
   Molecular orbital symmetry, Frontier orbital of ethylene, 1, 3- butadiene, 1, 3, 5- hexatriene and allyl system. Classification of pericyclic reactions. Woodward-Hoffmann diagrams. FMO and PMO approach. Electrocyclic reactions, 4n, 4n+2 and allyl systems. Cycloadddition – antarafacial and suprafacial additions, 4n and 4n+2 systems, 2+2 addition of ketenes, 1,3 dipolar cycloadditions and cheleotropic reactions. Sigmatropic rearrangements–suprafacial and antarafacial shifts of Hydrogen, sigmatropic shifts involoving carbon moieties, 3, 3- and – sigmatropic rearrangements. Claisen, Cope and aza-Cope rearreangements, ene reaction.

2. **Metal Salt Catalysis**
   (a). Fundamental reaction steps of transition metal catalysed reaction.
   oxidative-addition reactions, elimination reactions, cleavage of C-H bonds, migration reaction, insertion reaction.
   (b). Homo/heterogeneous catalysis by transition metal complexes.
   Hydrogenation reaction, alkene isomerization, hydrosilylation and hydroboration reaction, alkene hydrogenation, reaction of CO and hydrogen, hydroformylation of unsaturated compounds, carbonylation reactions, C-C cross coupling and related reaction, reaction of conjugated dienes, reaction of alkynes, , alkene and alkyne metathesis, phase transfer catalysis.
   (c). C-H activation using metal salts, Suzuki reaction, Heck reaction, Negishi coupling, Stille reaction, Sonogashira coupling reactions.

3. **Cycloaddition reaction in Organic Synthesis**
   Cycloaddition reactions:- Brief introduction, types of cycloaddition reactions, diene , dienophiles, intra and inter-molecular Diels Alder reaction (Lewis acid catalysed and uncatalysed), , brief introduction to diene and heterodiene and their cycloaddition reaction (2+2 and 4+2) with dienophiles, regiochemistry and stereochemistry in Diels alder reaction, povarov reaction, aza-diels alder reactions, normal and inverse electron demand cycloaddition reactions, heterodienophiles , Hetero Diels alder reactions (general introduction), 1,3-dipolar cycloaddition reactions

4. **Multicomponent cycloaddition reactions,** brief introduction to transition metal salts catalysed reactions, brief introduction to (m+o), (m+n+o) type reactions with emphasis on 3+2; 4+3, 2+2, 4+2, 5+2, 2+2+2,3+2+2, 5+2+1 types of reactions.

Books

1. Advanced Inorganic Chemistry F.A Cotton 6th addition chapter 21 and 22, p. 1167-1294.
2. Cycloaddition reactions in organic synthesis by W. Carruthers in the Tetrahedron Organic Chemistry Series, edited by J. E. Baldwin and P. D. Magnus, Pergamon Press, Oxford, 1990.
3. S.M. *Mukherji* and S. P. *Singh*, Reaction Mechanism in *Organic* Chemistry.
4. Inorganic Chemistry:Principles of Structure and Reactivity by James E. Huheey, Ellen A. Keiter, Richard L. Keiter
5. Some Modern Methods of Organic Synthesis by W Carruthers, Cambridge University Press.
6. Smith M B , March J March's Organic Chemistry 5th ed (2001)(2103s), Wiley, New York.

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Annexure-B

02 Medicinal Chemistry

Total Hours: 45

No. of Lectures LTP-3-0-0

Structure, stereochemistry, nomenclature, mode of action, specific clinical applications and structure activity relationships of following classes of drugs and synthesis/commercial routes to specified drugs.

1. **CNS Active Drugs: CNS Depressants: Hypnotics and sedatives**: Barbiturates, Non-barbiturates, Amides and Imides, Glutethimide, Benzodiazepines, Aldehydes and derivatives, Methaqualone and other miscellaneous agents. **Anticonvulsants**: Barbiturates, Hydanatoins, Oxazolidinediones. Succinimides, Bezodiazepines, Thenacemide, Glutethimide. **CNS-stimulants & Psychoactive drugs**: Analeptics, Purines, Psychomotor stimulants, Sympathomimetics, Monamine oxidase inhibitors, Tricyclic antidepressants, Miscellaneous psychomotor stimulants. Hallucinogens **(Psychodelics, Psychomimetics)**: Indolethylamines, R-phenylethylamines, Butyrophenones and other miscellaneous drugs.
2. **Commercial Synthetic routes to:** Thioridazine, Haloperidol, Chloropromazine, Phenytoin, Phenobarital, Carbamazipine valproic acid, Methaqualane, Nitrazepam, Oxazepam, Diazepam, Cholridazepoxide

3. **Antibacterial and Antiviral Agents**: History of Antibacterial Drugs, Types, Classifications, Structural Activity Relationship, Fluoroquinolones, Mechanism of Action Of Antibacterial, ß-lactams, Bacterial Resistance against Antibacerial Drugs,
   Target for Anti HIV Drugs. Anti HIV Agents: HIV-Protease inhibitors, Amprenavir, Foseprenavir, Alazanavir etc. Anti-HIV Nucleosides: Lamivudine, Retrovir, Videx, Hivid, Zlarit, Viread, Carbovir, Delavirdine, Ziduvidine, Etavirenz, Calanolide, Capravine, Nevirapine. DNA Polymerase inhibitors: Acyclovir, Ganciclovir, Penciclovir, Famicilovir, Valaciclovir, Valomaciclovir, Codofvir.

4. **Antineoplastic agents**: Alkylating agents (Nitrogen mustards, Aziridines, Sulfonic acid Esters, Epoxides, Nitrosoureas, Triazenes, Phosphamides, Mitomycin, Comparative activity of alkalyting agents). **Antimetabolilities**: Antifolates (Methotrexate). Mercaptopurine, Thioguanine, Flourouracil, Floxuridine, Cytarabine, Azathioprine, Antitumor, antibiotics, Dactinomycin, Daunorubricin, Aclacinomycin, Mithramycin, Bleomycin, **Miscellaneous compounds**: Cisplatin, Taxol, Gunazole, Pipobromin. **Antitumor alkaloids**: Vincristine, Vinblastine. **Hormones agonist and antiagonists**: Steroids, Tamoxifen, Mitotane, Dromastanolone propionate, Testalactone, Megestrol acetate Immunotherapy.

Books Recommended:

1. Wilson and Gisvolds Textbook of Organic Medicinal and Pharmaceuticals Chemistry, 8th edition, edited by R.F. Deorge, J.B. Lippincott Company, Philadelphia, 1982.
2. Pharmaceutical Chemicals in Perspective. B.G. Reuben and H.A. Wittcoff, John Wiley & Sons, New York, 1989.
3. W.O. Foye, T.L. Lamke, D.A. Williams, Principles of Medicinal Chemistry, 5th edition, Lippencott Williams and Wilkins, 2002.

23/7/16

24/7/16

Annexure-D

LABORATORY PRACTICES AND SEAFTY

ESL964

L	P	T	C
3	0	0	3

Total Hrs 45

1. **Introduction to chemical analysis:**

   Nature of analytical chemistry, General directions of chemical analysis: Cleanliness in the laboratory, Recording and planning data. Data quality: Bias, Precision, Uncertainty, Method detection limit, Checking correctness of analysis, Expression of results, Significant figures, Collection and preservation of sample.

2. **Data Analysis:**

   Uncertainties, Errors, calibrations, Mean, Standard Deviation, Least square fit.

3. **Laboratory apparatus and glassware**:

   Lab wares, soft Vs heat resistant glasswares, lab ware's of plastic, porcelain, platinum and nickel. Volumetric flasks, Pipette, burette, Cleaning of volumetric glassware. Calibrations of Glass wares ,Types of balances: Analytical balances, Desiccators.

4. **Chemical reagents and standards:**

   Grade and purity of chemicals, Proper storage of chemicals and standards, Laboratory pure water, Preparation of reagent grade water, Reagent water quality.

   Quality assurance of chemical measurements: Quality assurance, quality control, Quality assessment, Sampling, Sampling custody, Sample preparation, Analytical methodology with case studies, Calibrations, Detection limits, Statistics in chemical analysis, Quality control charts.

5. **Reagents and solutions.**

   Stock standardization solutions, Preparation and standardization of common standard solutions.

6. **Common Laboratory techniques:**

Gravity, Vacuum, Centrifugation, Distillation: Simple, Fractional, Vacuum, Refluxing, Ion exchange, Drying and washing sample, Liquid-liquid extraction by separating funnel, Soxhlet extraction and filtration.

7. **Inventory Management:**

Software's for stock room management, Role of computers in Laboratory occupational health and safety, Waste minimization and disposal.

8. **Laboratory hazards and safety**:

Lab design, Fume hoods, Chemical safety aspects, Fire, Careless habits, Safe Storage, Handling of Chemicals, Handling of compressed gases, Stockroom safety rules, and Laboratory safety rules. , Protection of Environment, Disposal of Chemicals, Bio safety, chemical and electrical safety, Fire safety, Radiation safety, Eyewash and safety shows, Routine mock drills for lab safety.

References:

1. Environmental Sampling and Analysis by Csuros, M.,Lewis Publications.
2. Standard methods for the examination of water Author /publisher missing ?????
3. Laboratory Safety for Chemistry Students, by Robert H. Hill Jr. (Author), David C. Finster (Author), Wiley(second Edition)
4. Good Laboratory Practice Regulations, Fourth Edition, by Sandy Weinberg,CRC press

RESEARCH METHODOLOGY

Course code	L	T	P	C
PHAS - 901	3	1	0	4

1. **Introduction to Research:-**

   Objectives of research, motivation in research, types of research, significance of research, research methods vs methodology, research process in flow chart, criteria of good research, problems encountered by researchers in India.

2. **Thinking Processes:**

   Role of thinking in research, levels and styles of thinking; common-sense and scientific thinking; examples.

3. **Problem solving:**

   Problem solving strategies – reformulation or rephrasing, techniques of representation, logical thinking, division into sub- problems, verbalization, awareness of scale; importance of graphical representation; examples

4. **Experimental and modeling skills:**

   Census and sample survey, sampling procedure, important scaling techniques, methods of data collection, estimation and reduction of random errors; detection and elimination of systematic errors; guidelines for constructing questionnaire, Scientific method; role of hypothesis in experiment; hypothesis testing; F test, t test, Chi Square test, use of ANOVA; Types of models; the art of making approximations; problem representation; logical reasoning; mathematical skills; techniques of numerical simulation.

5. **Problem finding and literature survey:**

   Information gathering – reading, searching and documentation; types, attributes and sources of research problems; problem formulation, relative

importance of various forms of publications; choice of journal and reviewing process; Difference between publishing and patenting;

6. **Chemdraw and documentation**

Difference between TEX and LATEX, basics of using latex, latex input files, input file structures, layout of the document, titles, chapter and sections, cross references, foot note, environments, typesetting, building blocks of a mathematical formula, matrices, tables, including encapsulated postscript graphics, bibliography, downloading and working of CHEMDRAW software

7. **Data And its Presentation**

Introduction to origin, basics of importing and exporting data, working with Microsoft excel, graphing, statistics in origin, hypothesis testing, power and sample size, basic linear regression and curve fitting.

8. **Statistical Analysis of Data**

Error Analysis and Basic Statistics Measuring errors, uncertainties, parent and sample distributions, mean and standard deviation of distribution, types of probability distribution, instrumental and statistical uncertainties, propagation of errors, specific error formulas, method of least square fitting.

9. **Multivariate analysis:**

Multiple regression, multiple discriminant analysis, multipleanalysis of variance, canonical correlation analysis, Factor analysis cluster analysis, path analysis. Computational techniques.

10. **Stress management, Time management, Interpersonal skills, professional ethics:**

Psychological phases of a PhD process; stress points; Managing self; teamwork; sense of humor; Plagiarism and research ethics

REFERENCES:

1. Research methodology: (http://www.newagepublishers.com/samplechapter /000896.pdf)

2. The not so short introduction to LATEX by TobianOetiker, Hubert Partl, HreneHyna and Elisabeth Schlegl, Version 4.16, May 08,2005.(http://tobi.oetiker.ch/lshort/lshort.pdf)

3. T.Veerarajan and T. Ramachandran "Numerical methods" Tata McGraw Hill, New Delhi, 2008

4. Data reduction and error analysis for physical sciences by Philip R. Bevington and D. Keith Robinson. (http://www.physast.uga.edu/files/phys3330_fertig/Basic ErrorAnalysis.pdf)

5.E.M. Phillips and D S Pugh, "How to get a PhD – a handbook for PhD students and their supervisors", Viva books Pvt. Ltd for all scholars irrespective of their disciplines.

6.Handbook of Science Communication, compiled by Antony Wilson, Jane Gregory, Steve Miller, Shirley Earl, Overseas Press Indian Pvt. Ltd, New Delhi, first edition 2005.

7.G L Squires, "Practical physics", Cambridge University Press for all scholars except those from Humanities and Management sciences.

8.Peter B Medeq, " Advice to a Young Scientist", Pan Books, London 1979.

9. Kothari C R, "Research Methodology – Methods and Techniques", Wishwa Prakashan, New Delhi, Third Edition 2008.