Course Structure and Syllabus for 2-year 4-semester M. Tech. Course in Pharmaceutical Technology

(With effect from Academic year 2024-2025)

1st Semester:

Paper No	Sub Code	Subject	Periods			Cr	Marks		
			L	T	P		IA	UE	TM
Theory									
I	**CHT101**	Process Modelling and Simulation	3	1	-	4	30	70	100
II	**PHT102**	Advanced Pharmaceuticals Analysis	3	1	-	4	30	70	100
III	**PHT103**	Medicinal Chemistry	3	1	-	4	30	70	100
Practical									
IV	**CHT104**	Computer Application in Chemical Industries	-	-	8	4	60	40	100
V	**PHT105**	Pharmaceutical Analysis and Quality Assurance	-	-	8	4	60	40	100
		Total	9	3	16	20	310	290	500

2nd Semester:

Paper No	Sub Code	Subject	Periods			Cr	Marks		
			L	T	P		IA	UE	TM
Theory									
VI	**CHT201**	Optimization	3	1	-	4	30	70	100
VII	**PHT202**	Pharmaceutical Biotechnology	3	1	-	4	30	70	100
VIII	**PHT203**	Pharmaceuticals and Cosmetics Process Technology	3	1	-	4	30	70	100
IX	**PHT204**	Industrial Management and Regulatory Affairs	3	1	-	4	30	70	100
Practical									
X	**PHT205**	Pharmaceutical Technology Laboratory	-	-	8	4	60	40	100
		Total	12	4	8	20	180	320	500

3rd Semester:

Paper No	Sub Code	Subject	Periods			Cr	Marks		
			L	T	P		IA	UE	TM
XI	**CHT301**	Research Methodology	-	2	-	2	15	35	50
XII	**PHT302**	a. Project Feasibility – Report	-	2	8	6	90	60	150
		b. Project Feasibility – Viva Voce	-	-	-	4	-	100	100
XIII	**PHT303**	Mini Project with seminar	-	4	-	4	-	100	100
XIV	**PHT304**	Thesis: Foundation	-	-	-	4	-	100	100
		Total	-	8	8	20	105	405	500

4th Semester:

Paper No	Sub Code	Subject	Periods			Cr	Marks		
			L	T	P		IA	UE	TM
XV	**PHT401**	a. Thesis: Final-Report	-	4	16	12	-	-	300
		b. Thesis: Final-Viva Voce	-	-	-	4	-	100	100
XVI	**PHT402**	General Viva Voce	-	-	-	4	-	100	100
		Total	-	4	16	20	-	500	500

Total Credit Point: 20 + 20 + 20 + 20 = 80; **Grand Total:** 2000

IA: Internal Assessment; UE: University Examination; TM: Total Marks

SYLLABI OF 2 YEARS (FOUR SEMESTER) M.TECH. COURSE IN PHARMACEUTICAL TECHNOLOGY

First Semester

Paper I

Course CHT 101 **100 Marks/ 4 credits**

Module 1: Mathematical Modeling Fundamentals: Art of modeling, laws, assumptions, degrees of freedom, consistent modeling, synthesis, analysis and optimization. General purpose modeling, specific purpose modeling, scientific modeling, engineering modeling.

Module 2: Models of equipment, unit operation/unit process; material & energy balance, property relations, Constraints, steady state and unsteady state models. Specific Equipment Design models: Batch reactor, continuous tank reactor, Continuous tubular, catalytic reactor, heat exchanger, Distillation column.

Module 3: Plant modeling, stream variable and stream properties, tear stream and tear variable, modular approaches: sequential, simultaneous and equation solving approaches. Sequencing and ordering of solving equations.

Plant modeling: A plant with/without a recycle stream, plant with controlling elements. **Module 4:** Solution algorithm and flow chart development for various mathematical models. Computer simulation**:** Programming languages, sequences and algorithm development.

Specific simulators**:** Binary distillation column, Heat exchanger, reactor, flasher.

Plant flowsheeting: Three CSTR in series, Propylene dimerization plant, sulfuric acid plant, etc.

Recommended Books:

1. Mathematical and computational modeling: With applications in natural and social sciences, engineering, and the arts by Roderick Melnik, John Wiley & Sons.
2. Mathematical Methods in Chemical Engineering by V.G. Jenson and G.V. Jefferys, Academic Press – 2nd Editions.
3. Mathematical Modeling in Chemical Engineering by Roger, G.E. Franks – John Wiley Sons Inc.
4. Process Modeling, Simulation and Control for Chemical Engineers by W.L. Luyben, McGraw Hill Books Co.

Paper II

Course PHT 102 **100 marks/ 4 credits**

Advanced Pharmaceuticals Analysis

Module 1: Chromatography (HPLC, GLC, TLC, HPTLC, UPLC, Column chromatography) for analysis of pharmaceuticals. Principles and applications of ion chromatography, affinity chromatography, chromatography of chiral compounds, flash chromatography and vacuum liquid chromatography, size exclusion chromatography, supercritical fluid chromatography. Hyphenated techniques in drug analysis *like* GC-MS, LC-MS, HPLC-IR.

Pharmacognostic analysis. Stability studies in different stages of drug and product development, regulatory requirements. Stability testing for phytopharmaceuticals, regulatory requirements, finger

printing, biomarkers, chemical interactions and complexity.

Module 2: Spectroscopy (UV-Vis-NIR, FTIR, NMR, FT-Raman) for drug analysis and organic compound identification. Thermal analysis in pharmaceuticals DSC, DTA, TGA. Light scattering techniques and particle analysis. Electrophoresis and Zeta potential studies.

Electrochemistry (Voltammetry, Amperometry, Potentiometry and Polarography) in the analysis of drugs and pharmaceuticals.

Module 3: Biological standardization. Toxicity studies of drugs. Principles of Immunoanalytical techniques, DNA Hybridization, enzyme assays, protein analysis, ELISA, Principles of PCR, DNA finger printing. Analysis of Industrial wastes.

Recommended Books:

1. Introduction to instrumental analysis by Robert. D. Braun.
2. A Text book of Pharmaceutical Analysis by Kerrenth A. Connors 5. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel.
3. High Performance thin layer chromatography for the analysis of medicinal plants by Eike Reich, Anne Schibli.
4. HPTLC by P.D. Seth.
5. Instrumental Methods of Chemical Analysis by B.K Sharma.
6. Organic spectroscopy by Y.R Sharma.
7. Principles of Instrumental Analysis, 5th edition, Eastern press, Bangalore, 1998.
8. Instrumental methods of analysis by Willards, 7th edition, CBS publishers.
9. Spectrophotometric identification of Organic Compounds by Silverstein.
10. Indian Pharmacopoeia 2018.
11. Biophysical Chemistry, Principles and Techniques. Himalaya Publishing House.
12. Immunology – an Introduction by J. Kubey.
13. Immunodiagonstics by S.C. Rastogi, New Age International.
14. Immunology and Immunotechnology by Ashim Chakravarthy, Oxford University Press.
15. Molecular Immunology by E. Benjamini.

Paper III

Course PHT 103 **100 marks/4 credits**

Medicinal Chemistry

Module 1: Bioconjugation chemistry, non-covalent interactions. Receptorology, topological and stereochemical considerations. Enzyme kinetics, catalysis and drug action. Drug metabolism in Phase I and Phase II transformations. Concept of hard and soft drugs. ADMEand toxicity profiles.

Module 2: New generation chemotherapeutic agents. Chemically targeted drugs. Steroidal drugs. Macromolecular drugs, peptides, peptidomimetics. glycobiology, functionalized systems, lipoproteins, self assembly formations in biology.

Module 3: Molecular modeling and dynamics, Monte Carlo simulations. Informatics techniques-bioinformatics and chemoinformatics

Role of the metal catalysts. Hydroboration. Synthesis approaches in drugs and pharmaceuticals, retro synthetic analysis; stereoselective and chemoselective synthesis; appropriate examples. Catalysts and auxiliaries. Enzymes in chiral synthesis, Kinetic resolution. Asymmetric synthesis protocols in amino acids and beta lactams.

Recommended Books:

1. Bioconjugate Techniques (3rd edition) by Greg T. Hermanson.
2. Lehninger Principles of Biochemistry by David L. Nelson & Michael M. Cox, W.H. Freeman & Company.
3. Biochemistry by Stryer , W. H. Freeman & Company.
4. Handbook of Drug Metabolism, edited by Paul Gerard Pearson, Larry C Wienkers, CRC Press.
5. Foundations of Pharmacokinetics by A. Rescigno.
6. Clinical Pharmacokinetics and Pharmacodynamics: Concepts and Applications by M. Rowland and T. N. Tozer.
7. The Pharmacological basis of therapeutics by Goodman and Gilman's.
8. Pharmacotherapy by DiPiro.
9. Pharmacology by Katzung
10. Macromolecular drug delivery: basic principles and therapeutic applications by Mattias Belting and Anders Wittrup.
11. Self-assembling biomaterials: Molecular design, characterization and application in biology and medicine, Woodhead Publishing.
12. Molecular Modeling: Principles and Applications by Andrew R. Leach, USA: Prentice Hall, 2007.
13. Understanding Molecular Simulation: From Algorithms to applications by Daan Frenkel and Berend Smit, USA: Academic Press, 2002.
14. Guidebook on Molecular Modelling In Drug Design by N. Claude Cohen, California: Academic Press, 2006.
15. Molecular Modelling for Beginners by Alan Hinchliffe, USA: John Wiley & Sons, 2008.
16. Organic Synthesis - The Disconnection Approach by S. Warren, Wily India.
17. Principles of Organic Synthesis by R.O.C. Norman and J.M. Coxan, Nelson Thorns.
18. Organic Synthesis - Special Techniques by V.K. Ahluwalia and R. Agarwal, Narosa Publishers.
19. Organic Reaction Mechanisms IV Edtn by V.K Ahluwalia and R.K. Parashar, Narosa Publishers.

Paper IVLab – I

Course CHT 104 **100 marks/4 credits**

Computer Application in Chemical Industries

Writing computer program to solve complex design and modeling problems like heatexchangers, flashers, reactors, distillation columns, plant simulation problems etc.

Recommended Books:

1. Chemical process modelling and computer simulation by Amiya K Jana, PHI Learning Pvt. Ltd., 2018.
2. Chemical engineering dynamics: an introduction to modelling and computer simulation. Vol. 3. John Wiley & Sons, 2008.

Paper VLab – II

Course PHT 105 **100 marks/4 credits**

Pharmaceutical Analysis and Quality Assurance

Quantitative analysis of APIs and finished products including Multi component analysis, using UV-Vis-NIR, FTIR, HPLC, HPTLC.

Molecular Purity analysis using NMR, HPLC, HPTLC. Gas chromatography, residual solventanalysis.

Optical microscopy in analysis of crude drugs.

Enzyme based assays, enzyme inhibition kinetics, biochemical analysis using instrumentaltechniques like ELISA.

Analysis of environmental contaminants, PPCPs, colorants, BOD, COD studies. Microbialassays for antibiotics and vitamins, sterility testing.

Recommended Books:

1. Pharmaceutical quality assurance by Mr Manohar A Potdar, Pragati Books Pvt. Ltd., 2006.
2. Handbook of modern pharmaceutical analysis, Academic press, 2010.
3. Pharmaceutical analysis, John Wiley & Sons, 2008.

Second Semester

Paper VI

Course CHT 201 **100 marks/4 credits**

Optimization

Module 1: Indroductory concepts : Objective function, single valued function, multivalued function, non-linear function, linear function, stationary point, relative and absolute extreme, convex, concave and unimodal functions, gradient reduction method, jacobian and hessian matrix.

Module 2: Optimization of univariate system using analytical method. Search techniques, quadratic interpolation, cubic interpolation. Optimization of multivariate unconstrained system using.

Module 3: Search techniques. First order methods and second order methods. Optimization of multivariate constrained systems using Lagrange multipliers, penalty function, linear programming and non-linear programming.

Module 4: Computer programming of optimization of specific problems related with chemical industry.

Recommended Books:

1. Operation Research by P. Gupta and D.S. Hira, S. Chand & Company Ltd.
2. Operations Research by H.A. Taha, Prentice Hall.
3. Engineering Optimization: Theory and Practice by S.S. Rao, New Age Publication.
4. Operations Research: Theory, methods & applications by S. D. Sharma & H. Sharma.
5. Introduction to Optimum Design, Elsevier Academic Press.
6. Introduction to Operations Research by Hiller & Libermann, Tata McGraw Hill.
7. Operation Research by A. Taha Hamdy, Pearson Education.
8. Operation Research by V. K. Kapoor, S. Chand Publication.

Paper VII

Course PHT 202 **100 marks/4 credits**

Pharmaceutical Biotechnology

Module 1: Principles and applications of genetic engineering, cDNA library, cloning strategies Plasmids – host range, λ phage – insertional and replacement vectors, single strand DNA vector. Cosmids. RNA probe synthesis, Protein expression, purification.
DNA sequencing, chemical & enzymatic methods, automated sequence, genome sequencing methods. PCR– principle, applications and types. Real-time PCR – SYBR. Green assay, Taqman probes, molecular beacons, mutagenesis and chimeric protein engineering by PCR, RACE, Kuntels' method of mutagenesis.
Module 2: Stem cells - propagation, proliferation, growth; principles of tissue engineering, tissue engineering materials. Biotransplantables, biomedical devices classification, material requirements. Examples of genetic diseases, human genome studies, molecular medicines, pharmacogenomics.
Module 3: Principles and applications of Biosensors, examples like glucose monitoring, DNA biosensors, microbial biosensors. Principles and application of product bioseparation.
Enzyme manufacture, therapeutics, validation, chemical implication. Antibody synthesis – design, validation and application.

Recommended Books:

1. Pharmaceutical Biotechnology by S.P.Vyas and V.K.Dixit, CBS Publishers.
2. Biotechnology by Purohit and Mathur, Agro-Bios, 13th edition.
3. Elements of Biotechnology by P.K. Gupta, Rastogi Publishers.
4. Analysis of Genes and Genomes by Richard J. Reece. John Wiley & Sons.
5. Molecular Biotechnology by Principles and Applications of Recombinant DNA by Bernard R. Glick, Jack J. Pasternak and Cheryl L. Patten, ASM Press.
6. Principles of Fermentation Technology by P. F. Stanbury, A. Whitaker, S. J. Hall., Butterworth-Heinemann.
7. Bioprocess Engineering Principles by Pauline M. Doran, Academic Press.
8. Pharmaceutical Biotechnology by Concepts and Applications by Gary Walsh, John Wiley & Sons.
9. Biosensors: Theory and Applications by Donald G. Buerk, CRC Press, 1995.
10. Microsystem Technology in Chemistry and Life Sciences, Springer-Verlag, New York, 1999.
11. Nanobiosensors for personalized and onsite biomedical diagnosis, Michael Faraday House, London, United Kingdom, 2016.
12. Introduction to Enzyme and Coenzyme Chemistry, 3rd Edition 2012 by T.D.H. Bugg, Wiley-Blackwell.
13. Introduction To Molecular Vaccinology by Giese M, Springer

Paper VIII
Course PHT 203 **100 marks/4 credits**
Pharmaceuticals and Cosmetics Process Technology
Module 1: Unit operations involved in manufacturing of dosage forms. Solubility and drug

solubilization techniques. Particle size and shape factors significance in dosage forms.Dosage design protocols, preformulation studies, prototype development, pharmaceutical scale up studies, commercialization and post marketing survelience. Pharmacovigilance.
Sterile products and admixtures: Formulation development.
NDDS, sustained release systems, transdermal formulations, nanomedicines, microparticles and microcapsules, facilitated delivery devices - floatable devices, responsive release systems.
Module 2: Biopharmaceutics and pharmacokinetics, Pharmacokinetic design for DDS, in- vitro/in-vivo considerations.
Stability studies, GMP/GLP practices.
Package protocols for different dosage forms, packaging materials for pharmaceuticals, labeling, screening of package, bar-coding.
Module 3: Cosmetics formulations, classifications, and examples of different preparation types like, hair products, dental products, deodorant and antiperspirants etc., regulatory requirements in cosmeticology.
Polymerization and polymer fabrications for pharmaceutical applications. Modification techniques for biomaterials, polymer biodegradation.

Recommended Books:

1. Pharmaceutics - The Science of Dosage form design by M.E. Aulton.
2. Pharmaceutical Dosage forms by Lieberman, Lachman and Schwartz.
3. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.
4. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.
5. Textbook of Pharmacovigilance: Concept and Practice by G.P. Mohanta and P. K. Manna, Pharma Med Press, 2016.
6. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P.Martin, Informa Health care Publishers.
7. Novel Drug Delivery Systems, 2 nd edition, by Y. W. Chien, Marcel Dekker, Inc., New York, 1992.
8. Controlled Drug Delivery Systems by Marcel Dekker, Inc., New York, 1992.
9. Encyclopedia of Controlled Delivery by Edith Mathiowitz, Wiley Interscience Publication, John Wiley and Sons, Inc, New York.
10. Controlled and Novel Drug Delivery by N.K. Jain, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
11. Controlled Drug Delivery -concepts and advances by S.P. Vyas and R.K. Khar, Vallabh Prakashan, New Delhi, First edition 2002.
12. Biopharmaceutics and Clinical Pharmacokinetics by Milo Gibaldi.
13. Biopharmaceutics and Pharmacokinetics by Robert F. Notari
14. Applied biopharmaceutics and pharmacokinetics by Leon Shargel and Andrew B.C.YU 4th edition,Prentice-Hall Inernational edition.USA
15. Bio pharmaceutics and Pharmacokinetics-A Treatise by D. M. Brahmankar and Sunil B.Jaiswal,Vallabh Prakashan Pitampura, Delhi.
16. Pharmacokinetics by Milo Glbaldi Donald, R. Mercel Dekker.
17. Good Laboratory Practice Regulations, 2 nd Edition, Vol. 69 by Sandy Weinberg.
18. Pharmaceutical Packaging technology by D.A. Dean. E.R. Evans, I.H. Hall. 1 st Edition (Reprint 2006). Taylor and Francis. London and New York.

19. Harry's Cosmeticology by Wilkinson, Moore, Seventh Edition and George Godwin.
20. Cosmetics – Formulations, Manufacturing and Quality Control by P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.
21. Text book of cosmelicology by Sanju Nanda & Roop K. Khar, Tata Publishers.
22. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
23. Drugs and Cosmetics Act/Rules by Govt. of India publications.
24. Introduction to Polymers by Robert J. Young, Peter A. Lovell, Published by CRC Press.
25. Polymers in Drug Delivery Edited by Ijeoma F. Uchegbu, Andreas G. Schatzlein, Published by CRC Press.

Paper IX

Course PHT 204 **100 marks/4 credits**

Industrial Management and Regulatory Affairs

Module 1: National Drug Regulatory requirements, National Drug Policy, Drugs and Cosmetics Act, NPPA. USFDA, FDA guidelines on IND, NDA and ANDA approvals. Bio-equivalence, Biowaiver. Types of ANDA filing, exclusivities.

Module 2: ICH Guidelines, WHO guidelines, ISOs- Production design, certification. FDA guidance for industries and comparative implications.

Indian Patent Act, drugs and pharmaceuticals. Indigenous products patenting, biodiversity regulations. Intellectual property agreements, TRIPS, WTO treaties, Budapest Convention.

Module 3: OECD guidelines, LD50, acute, subacute and chronic toxicity studies; toxicity and carcinogenicity testing protocols, current requirements.

Ethics in animal experimentations. Human experimentation-Nuremberg code and Helsinki declaration. Cartagena Protocol on Biosafety Considerations. Environmental Issues, Biosafety, biodiversity regulations.

Recommended Books:

1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http,//en.wikipedia.org/wiki/Regulatory_ Affairs.
2. International Regulatory Affairs Updates, 2005. available at http://www.iraup.com/about.php
3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition.
4. Regulatory Affairs brought by learning plus, inc. available at http.//www.cgmp.com/ra.htm.

Paper X Lab – III

Course PHT 205 **100 marks/4 credits**

Pharmaceutical Technology Laboratory

Drug solubility studies, inclusion complexes, solubilization and interactions in multicomponent systems.

Synthesis and analysis of polymeric, nanomedicines.

Synthesis, stabilization and antimicrobial efficacy of silver nanoparticles.

Operation principles in pharmaceuticals drying, including spray drying, tray dryers etc. Size reduction techniques, ball milling, sieving analysis, granulation,drug dissolution.

Pharmaceutical formulations and stability experiments.

Synthesis (3 or more steps) and isolation of pharmaceutically important compounds. Synthesis of permitted dyes, intermediates, quality analysis.

Recommended Books:

1. Bentley's Textbook of Pharmaceutics-E-Book by Sanjay Kumar Jain and Vandana Soni, Elsevier health sciences, 2011.
2. Nanostructures and nanomaterials: Synthesis, properties and applications by G. Cao, Imperial College Press, 2006.
3. Modern Pharmaceutics by Gilbert S. Banker and Christopher T. Rhodes.
4. Synthetic dyes by Grudeep R. Chatwal.
5. Chemistry of Dyes and Principles of Dying by V.A. Shenai, Sevak Publication, Bombay.
6. Fundamental process of dye chemistry by Hans Eduard, Fierz-david and and Louis Blangey, Inter science publishers, New York.

Third Semester

Paper XI
Course CHT 301 **50 Marks/2 credits**
Research Methodology

Module 1: Introduction:
Definition of Research Methodology. Different types of methods for research. Approaches of investigation of solutions for research problem, Effective literature studies approaches, (Discuss in class Web Search: Introduction to Internet. Use of Internet and www. Using of search engines and advanced search tools.)
Data Collection and Simulation

Module 2: Data Analysis
Analysis tools: Review of Basic Statistical Measures (mean, median, mode, quartile, percentile, variance, covariance, correlation, regression), Probability Distributions (Binomial, Poisson, Uniform, Exponential, Normal), Central Limit Theorem, ANOVA, Latin Square Design, Sampling (Chi-square Distribution, F- Distribution), Test of Hypothesis.

Module 3: Reporting
Technical report writing, Technical paper writing, Plagiarism and citation. Major contribution, outcome of the research, patent possibilities. Patent writing, Patent filing, IPR
Introduction to presentation tool, features and functions, creating presentations, customising presentation using Microsoft PowerPoint, Open Office etc.
Introduction to spread-sheet applications, features and functions, using formulae and functions, data storing, features for statistical data analysis, generating charts/graphs and other features.

Paper XII

Course PHT 302 **(150+100) Marks/(6+4) credits**

a) Project Feasibility

Each student shall be required to submit two bound type written copies of a project report on a proposed chemical plant manufacturing product/products related to one's course/subject to be worked out under the supervision of a faculty member. The report shall include mass and energy balances, type and capacity of equipment selected and recommended, plant layout, feasibility analysis highlighting market survey, pattern of assistance available from the central and state government agencies, bank and financial institutions. Assistance for technology, raw materials, finance.
Legal obligation.

b) The student is to appear in a **Viva-Voce** examination.

Paper XIII

Course PHT 303 **100 Marks/4 credits**

Mini Project with seminar

Each student will be required to prepare and submit an assay or review paper on selected technological topic related to subject under the supervision of a faculty member. He/She shall give a talk based on his/her paper before the Seminar. The attendance in the seminar is compulsory for all the students.

Paper XIV

Course PHT 304 **100 Marks/4 credits**

Thesis: Foundation

Each student shall be required to carry out under the supervision of Faculty member (s) and/or External member as the case may be, an original investigation on an industrial problem related to one's course/subject. She/he shall submit two typewritten bound copies of a report on Research Work at least 15 days before the commencement of final semester examination and shall defend her/his report in a Viva-voce Examination.

Fourth Semester

Paper XV

Course PHT 401 **(300+100) Marks/ (12+4) credits**

Thesis: Final

(a) Each student shall be required to carry out under the supervision of a faculty member original investigation on an industrial problem related to subject. He/She shall submit three type-written bound copies of thesis embodying the results of his/her investigations

(b) The student shall defend his/her thesis in a **viva-voce** examination.

Paper XVI

Course PHT 402 **(100) Marks/ (4) creditsGeneral Viva Voce**

Each student shall be required to appear General Viva Voce Examination.