

SEM I

Quality Assurance Department (SEM I)

**MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES -
MPH101T / MPC
101T/ MQA101T/ MPL101T**

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPAT101 T.1K	Explain the principles and relate applications of UV-VIS spectroscopy, IR spectroscopy, Spectrofluorimetry, FES-AAS
MPAT101 T.2K	Summarize the principle and relate applications of NMR spectroscopy
MPAT101 T.3K	Summarize the principle and relate applications of Mass spectroscopy. Utilize the knowledge of principles of spectroscopic techniques to infer the structure
MPAT101 T.4K	Summarize the principle and relate applications of various types of liquid chromatography
MPAT101 T.5K	Explain the principles and relate applications of Electrophoresis and X-ray crystallography
MPAT101 T.6K	Summarize the principle and relate applications of various types of Thermal techniques DSC, TGA, DTA.

QUALITY MANAGEMENT SYSTEMS -MQA 102T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MQA 102T.1K	To build the knowledge of importance of quality in pharmaceutical industry.
MQA 102T.2K	To outline the guidelines related to maintain quality management in pharmaceutical industry.
MQA 102T.3K	To select the different tools for quality improvement.
MQA 102T.4K	To compare the ICH guidelines for determining stability of drug and drug substances.
MQA 102T.5K	To make use of statistical approaches to maintain quality of drug and drug products.
MQA 102T.6K	To interpret the regulatory compliance through quality management

QUALITY CONTROL AND QUALITY ASSURANCE- MQA 103T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MQA 103T.1K	interpret the GLP aspects in a pharmaceutical industry as per the regulatory guidelines
MQA103T. 2K	relate and interpret the cGMP guidelines as per regulatory bodies.
MQA103T. 3K	apply specifications to analytical tests for various dosage forms as per pharmacopoeias.
MQA 103T.4K	make use of department level and plant level documentation.
MQA 103T.5K	justify quality guidelines applicable to Pharmaceutical manufacturing operations and infer measures taken to comply.

PRODUCT DEVELOPMENT AND TECHNOLOGY TRANSFER -MQA 104T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MQA 104T.1K	Explain Principles of Drug discovery and development
MQA 104T.2K	Explain the concept and aspects of preformulation studies. Discuss various solubility enhancement techniques.
MQA 104T.3K	Outline Concept, Significance, design, layout of pilot plant scale up study and large scale manufacturing and analyze opportunities and challenges for New era of drug products:
MQA 104T.4K	Explain various types of packaging systems. Describe quality control tests for packaging materials.
MQA 104T.5K	Design Technology transfer and develop Documentation in technology transfer

PHARM QUALITY ASSURANCE I - MQA 105P

MQA105 P Pharmaceutical Quality Assurance Practical -I

CO Number	Course Outcomes: Upon completion of course students will be able to –
MQA105P. 1S	Analyse and interpret Pharmaceutical compounds and formulations by spectrometric techniques
MQA105P. 2S	Perform and Explain chromatography

MQA105P.3S	Illustrate Quality management principles through case studies, process capability study and stability study
MQA105P.4S	Perform analysis of raw materials, in-process materials and finished products as per pharmacopeia
MQA105P.5S	Determine physicochemical properties of bulk drugs

Pharmaceutics Department (SEM I)
NOVEL DRUG DELIVERY SYSTEM- MPH 102 T

CO Number	Upon completion of the course, student shall be able to understand
MPH 103T.1 K	The elements of preformulation studies
MPH 103T..2K	The Active Pharmaceutical Ingredients and Generic drug Product development
MPH 103T..3 K	Industrial Management and GMP Considerations
MPH 103T.4 K	Optimization Techniques & Pilot Plant Scale Up Techniques
MPH 103T.5 K	Stability Testing, sterilization process & packaging of dosage forms

REGULATORY AFFAIRS- MPH 104T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPH 104.1K	Tell the concept of innovator & generic drugs, drug development process
MPH 104.2K	Make use of knowledge regulatory guidance & guidelines for filing & approval process
MPH 104.3K	Compose Knowledge for preparation of Dossiers and their submission to regulatory agencies in different countries
MPH 104.4K	Extend Knowledge for post approval regulatory requirement for actives & drug product
MPH 104.5K	Build knowledge submission of global documents in CTD/CTD Formats
MPH 104.6K	Develop knowledge of clinical trial requirement for approvals for conducting clinical trials and gain pharmacovigilance & process of monitoring in clinical trial

PHARMACEUTICS PRACTICAL I (PRACTICAL)- MPH 105P

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPH 105P.1S	Operation of modern analytical instruments
MPH 105P.2S	Formulation and evaluation of novel drug delivery systems
MPH 105P.3S	Understand formulation and process factors affecting tableting operations
MPH 105P.4S	Will be able to perform preformulation studies
MPH 105P.5S	Various equations and theories governing performance of various formulations

Pharmacology Department (SEM I)

ADVANCED PHARMACOLOGY-MPL 102T

CO Number	At completion of this course it is expected that students will be able to
MPL 102T . 1K	Elaborate Pharmacokinetics aspects of drugs .
MPL 102T . 2K	illustrate the mechanism of action of drugs with respect to receptor interactions and elicited effects
MPL 102T. 3K	Explain the role of Neurohumoral transmission and non adrenergic non cholinergic transmission (NANC) in physiological and pathophysiological conditions.
MPL 102T 4K	Elaborate the pharmacology of drugs acting on CNS and its relevance in the treatment of different disease
MPL 102T . 5K	Discuss the pharmacology of drugs acting on CVS and its relevance in the treatment of different disease
MPL 102T . 6K	Discuss the physiological and pathophysiological role of Autocoids .

MPL103T - Pharmacological and Toxicological Screening Methods-I

CO Number	At completion of this course it is expected that students will be able to
MPL 103T.1K	The regulations and ethical requirement for the usage of experimental animals, good laboratory practices including of animal handling, drug administration, surgical, euthanasia techniques and experimentation on laboratory animals
MPL 103T.2K	To describe the various animals and breeding of laboratory animals.

MPL 103T.3K	To describe and design the preclinical testing methods for various biological activity including of bioassay techniques in the drug discovery process
MPL 103T.4K	To justify the general principles of immunoassay and testing methods
MPL 103T.5K	Correlate or extrapolate the invitro data to preclinical and preclinical to humans

CELLULAR AND MOLECULAR PHARMACOLOGY- MPL 104 T

CO Number	At completion of this course it is expected that students will be able to
MPL 105P.1S	Skill to perform animal handling, drug administration, surgical, anesthesia and euthanasia techniques.
MPL 105P.2S	Skill to use various softwares and techniques for data analysis
MPL 105P.3S	Skill to analyze and estimate the biological sample by HPLC,UV, Flame photometry or other modern analytical tools
MPL 105P.4S	Skill to develop qualities of critical thinking, problem solving, planning ability, sincerity, time management, use of appropriate method and professional identity in preclinical drug discovery research
MPL 105P.5S	Skill to use of various methods of isolation, identification and quantification of RNA, DNA, and protein samples including of fragmentation and apoptosis process

Pharmaceutical Chemistry Department : Sem I

ADVANCED ORGANIC CHEMISTRY I -MPC102T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPH102T. 1K	Understand basic concepts of SR, CR systems and novel drug delievry systems; apply knowledge to designing of DDS.
MPH102T. 2K	Elaborate various strategies for rate controlled DDS
MPH102T. 3K	Explain concept of gastroretentive and buccal DDS
MPH102T. 4K	Explain Occular Drug Delivery Systems, Barriers of drug permeation, Methods to overcome them
MPH102T. 5K	Explain Transdermal Drug Delivery Systems: with respect to Structure of skin and barriers, Penetration enhancers, Transdermal Drug Delivery Systems, Formulation and evaluation.
MPH102T. 6K	Explain Protein and Peptide Delivery with respect t0 Barriers for protein delivery. Formulation and Evaluation of delivery systems of proteins and other macromolecules

MPH102T. 7K	Explain Vaccine delivery systems with respect to Vaccines, uptake of antigens, single shot vaccines, mucosal and transdermal delivery of vaccines.
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ADVANCED MEDICINAL CHEMISTRY THEORY- MPC103T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPC103T. 1K	Discover different stages and Different techniques of drug discovery
MPC103T. 2K	Make use of knowledge of MOA and stereochemistry of drugs and SAR in developing drug research and also enzyme inhibitors
MPC103T. 3K	Utilize Various strategies to design and develop new drug like molecules for biological targets
MPC103T. 4K	Learn basics of Peptidomimetics and apply the concepts in designing pepdimimetic agents
MPC103T. 5K	Classify and make use of knowledge of Prodrugs ,resistance analog design

CHEMISTRY OF NATURAL PRODUCTS- MPC104T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPC104T. 1K	To explain and classify different types of natural compounds and their chemistry and medicinal importance
MPC104T. 2K	To elaborate Alkaloids, flavonoids, and steroids
MPC104T. 3K	To elaborate Terpenoids and Vitamins
MPC104T. 4K	To explain Recombinant DNA technology and drug discovery and drugs used in diabetic therapy and liver dysfunctioning
MPC104T. 5K	To discuss and analyse characterization of simple chemical constituents from natural source.

PHARMACEUTICAL CHEMISTRY -I : MPC 105 P

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPC 105P.1S	Analyse and interpret Pharmaceutical compounds and formulations by spectrometric techniques

MPC 105P.2S	Perform and Explain chromatography
MPC 105P.3S	Perform synthesis, purification and characterization of compounds based on rearrangement reactions
MPC 105P.4S	Isolate and analyse natural compounds

**M-PHARM SEM II
Quality Assurance Department**

HAZARDS AND SAFETY MANAGEMENT - MQA201T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MQA201T. 1K	Relate environmental problems among learner
MQA201T. 2K	Develop an attitude of concern for the industry environment
MQA201T. 3K	Spell knowledge ensure safety standards in pharmaceutical industry
MQA201T. 4K	Function to provide comprehensive knowledge on the safety management
MQA201T. 5K	Compose Knowledge to empower an idea to clear mechanism and management in different kinds of hazard management system and hazard

PHARM. VALIDATION- MQA 202T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MQA 202T.1K	Compare Qualification, Calibration and validation & apply it according to classification
MQA202T. 2K	Illustrate process for qualification of some analytical and manufacturing equipments
MQA202T. 3K	Explain the process for validation of Utilities and qualification of some laboratory equipments
MQA 202T.4K	Interpret Process validation for various dosage forms and parameters for validation of analytical methods
MQA 202T.5K	Explain validation of cleaning process and computerized systems.
MQA202T.	Illustrate types and regulatory procedures for Intellectual Property Rights.

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AUDITS AND REGULATORY COMPLIANCE- MQA 203T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPA203T.1K	Expalin importance of audit, its objectives and responsabilites. Choose methods for planning, management and information gathering for audit
MPA203T.2K	Elaborate and apply cGMP regulations for auditing of drug industries. Define responsabilites of management, manufacturing methods and various evaluation activities for acheving quality system approch.Design audit checklists for drug industries.
MPA203T.3K	Explain significance of the audit process of Granulation, tableting, coating, capsules, sterile production, packaging systems. List out aspects for vendor audits.
MPA203T.4K	Examine intricacies in auditing microbiological laboratory.
MPA203T.5K	List various aspects in auditing critical systems like HVAC, Water Systems, and ETP systems.

PHARMACEUTICAL MANUFACTURING TECHNOLOGY- MQA 204T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MQA 204T.1K	Outline Concept, Significance, design, layout of pilot plant scale up study and large scale manufacturing and Pharmaceutical industry developments: Production planning:
MQA 204T.2K	Explain Aseptic process technology, Advanced sterile product manufacturing technology, Process Automation in Pharmaceutical Industry
MQA 204T.3K	Explain Non sterile manufacturing process technology, Advance non-sterile solid product manufacturing technology, Improved Tablet Production, Problems encountered. Coating technology
MQA 204T.4K	Explain Containers and closures for pharmaceuticals
MQA 204T.5K	Outline Quality by design (QbD) and process analytical technology (PAT) and classify Elements of QbD

PHARM QUALITY ASSURANCE II - MQA205 P

CO	Course Outcomes: Upon completion of course students will be able to –
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MQA205P. 1S	Estimate organic and inorganic contaminants
MQA205P. 2S	Perform Qualification and validation exercises
MQA205P. 3S	Prepare audit check lists
MQA205P. 4S	Illustrate principle of QbD, PAT through case studies.
MQA205P. 5S	Design plant layout

Pharmaceutic Department (SEM II)

MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY & TARGETED DDS) (NTDS)- MPH 201T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPH 201T. 1K	Understand Concepts, Events involved in Targeted Drug Delivery Systems and Tumor targeting and Brain specific delivery.
MPH 201T. 2K	Understand principles of targetting using liposomes and nanoparticles
MPH 201T. 3K	Illustrate Types, preparation, evaluation and application of Monoclonal Antibodies, Niosomes, Aquasomes, Phytosomes, Electosomes.
MPH 201T. 4K	Formulating and evaluating intranasal and pulmonary DDS
MPH 201T. 5K	Nucleic acid based therapeutic delivery system ; Explain, Illustrate Potential target diseases for gene therapy
MPH 201T. 6K	Explain Biodistribution and Pharmacokinetics of therapeutic antisense molecules and aptamers as drugs of future.

ADVANCED BIOPHARMACEUTICS AND PHARMACOKINETICS -MPH 202T

CO Number	Upon completion of the course, student shall be able to understand
MPH 202T.1 K	Explain ADME, Describe drug dissolution process
MPH 202T.2 K	State various biopharmaceutic considerations in drug product design, describe In Vitro Drug Product Performance

MPH 202T..3 K	Explain various concepts of pharmacokinetics, describe compartment models
MPH 202T.4 K	Describe Bioavailability and Bioequivalence
MPH 202T.5 K	Classify various Modified–Release Drug Products, Explain Targeted Drug Delivery Systems and Biotechnological Products.

COMPUTER AIDED DRUG DEVELOPMENT MPH203T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPC 203T .1 1K	Relate Molecular Properties in CADD and role of CADD in drug discovery and Drug Design .
MPC 203T .2 1K	Understand And Identify Pharmacophore Features and Mapping and virtual Screening .
MPC 203T .3 1K	Analyze role of Molecular and Quantum Mechanics, energy minimization in molecular Docking and drug design.
MPC 203T .4 1K	Design the protocol of drug design using Computer Aided Drug Design(CADD) tools.

COSMETICS AND COSMECEUTICALS MPH 204 T

CO Number	Upon completion of the course, student shall be able to understand
MPH 204T.1 K	Key ingredients used in cosmetics and cosmeceuticals
MPH 204T.2 K	Biological aspects of conditions needing cosmetics and cosmeceuticals
MPH 204T..3 K	Current technologies in the market
MPH 204T.4 K	Have regulatory knowledge of cosmetics and cosmeceuticals
MPH 103T.5 K	Regulatory and formulation knowledge of herbal cosmetics and cosmeceuticals

PHARMACEUTICS PRACTICAL II -205P

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPH 205P.1S	formulate and perform evaluation of various types dosage forms and herbal product such as Alginate beads gelatin /albumin microspheres, liposomes/niosomes, spherules/microparticles, Creams, Shampoo and Toothpaste

	base,
MPH 205P.2S	make use of case studies of Bioavailability studies, Pharmacokinetic and IVIVC data analysis, In vitro cell studies for permeability and metabolism, Computer Simulations in Pharmacokinetics and Pharmacodynamics, Computational Modeling of Drug Disposition, Sensitivity Analysis, and Population Modeling
MPH 205P.3S	Design of Experiment.
MPH 205P.4S	Analyse Formulation data
MPH 205P.5S	To relate and interpret dissolution of two different marketed products /brands

Pharmacology department:(SEM II)

ADVANCED PHARMACOLOGY-II-MPL201T

CO Number be able to –	Course Outcomes: Upon completion of course students will
MPL 201T T. 1K	Elaborate the pharmacology of drugs acting on endocrine system and its relevance in the treatment of different disease.
MPL 201T T. 2K	Justify the significance of chronopharmacology in various diseases.
MPL 201T T. 3K	Classify drugs acting on GIT with respect to mechanism of action and its relevance in the treatment .
MPL 201T T. 4K	Discuss in detail Chemotherapy in infectious diseases and disorders of immune origin.
MPL 201T T. 5K	Relate the role of Free radicals and antioxidants in various diseases. .
MPL 201T T. 6K	Discuss Recent Advances in Treatment of Alzheimer’s disease, Parkinson’s disease, Cancer, Diabetes mellitus.

PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS-MPL202T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPL 202T.1K	Remember the importance of ethical and various regulatory requirements for toxicity studies.
MPL 202T.2K	Explain and designed the various types of general toxicity studies.
MPL 202T.3K	Discuss the IND and Safety pharmacology studies

MPL 202T.4K	Describe the toxicokinetic evaluation in preclinical studies
MPL 202T.5K	Summarized various alternative methods to animal toxicity testing
MPL 202T.6K	Compare and designed various reproductive toxicity and carcinogenicity studies in preclinical testing.

Principles of Drug Discovery MPL 203T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPL 203T.1K	Explain the various stages of drug discovery including role of genomics, proteomics, bioinformatics and newer targets/technology
MPL 203T.2K	Relate data obtained from combinatorial chemistry, HTS and in silico techniques to Lead identification
MPL203T. 3K	Elaborate on the importance of computer aided drug design/molecular docking in drug discovery
MPL203T. 4K	Evaluate the utility of various classical targets and biomarkers in a Drug discovery program
MPL203T. 5K	Explain the various approaches for Rational drug design
MPL203T. 6K	Discuss basic terms and general considerations for a range of <i>in vitro</i> assays/screening methods

Clinical Research and Pharmacovigilance MPL 204T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPL 204T.1K	Explain the regulatory requirements for conducting clinical trial
MPL 204T.2K	Compare and explain the types of clinical trial designs, different responsibilities of key players involved in clinical trials
MPL 204T.3K	Design various clinical documents such as protocol, IB, Case Report Forms, Clinical Study Report
MPL 204T.4K	Assess and interpret adverse drug reactions in context of Pharmacovigilance
MPL 204T.5K	Discuss ADR reporting tools and methods used in Pharmacovigilance.
MPL 204T.6K	Perceive the importance of Pharmacoepidemiology, pharmacoconomics, safety pharmacology

MPL 205P) Pharmacology Practical-II

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPL 205P.1S	Skill to measure the strength of drug by using various bioassay techniques
MPL 205P.2S	Skill to design, analysed and interpret the general toxicological testing protocols and report (including of acute and chronic) in preclinical research
MPL 205P.3S	Skill to design various clinical documents such as clinical trial protocol, Case Report Forms, Adverse drug reaction monitoring and reporting
MPL 205P.4S	Skill to design and execute the studies based on drug absorption as well as to plan alternative methods to animal toxicity testing including of in-silico based studies.
MPL 205P.5S	Skill to design and perform drug mutagenicity study using mice bone-marrow chromosomal aberration test
MPL 205P.6S	Skill to analyse various Serum biochemical, haematological, urine analysis, functional observation tests and histological studies in various preclinical studies.

Pharmaceutical Chemistry Department : Sem II Advanced Spectral Analysis: MPC 201T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPC 201T.1K	To make use of Woodward - Fieser rule calculating absorption maxima for 1,3-butadienes, cyclic dienes and α , β - carbonyl compounds and enones
MPC 201T.2K	To interpret the NMR spectra of various organic compounds
MPC 201T.3K	To build knowledge about Mass fragmentation rules, Fragmentation of important functional groups like alcohols, amines, carbonyl groups and alkanes
MPC 201T.4K	To outline theoretical and practical skills of the hyphenated instruments
MPC 201T.5K	To elaborate the different thermal methods of analysis along with interpretation

ADVANCED ORGANIC CHEMISTRY II -MPC202T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPC202T. 1K	Describe principles and applications of Green chemistry
MPC202T. 2K	Describe the concept of peptide chemistry and plan strategies for peptide synthesis
MPC202T. 3K	Discuss principles and methods of various Photochemical and pericyclic reactions
MPC202T. 4K	Explain chemistry and plan synthesis using different catalyst
MPC202T 5K	Explain the concept of stereochemistry and apply CIP rules

COMPUTER AIDED DRUG DESIGN-MPC203T

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPC 203T .1 K	Relate Molecular Properties in CADD and role of CADD in drug discovery and Drug Design .
MPC 203T .2 K	Understand And Identify Pharmacophore Features and Mapping and virtual Screening .
MPC 203T .3 K	Analyze role of Molecular and Quantum Mechanics, energy minimization in molecular Docking and drug design.
MPC 203T .4 K	Design the protocol of drug design using Computer Aided Drug Design(CADD) tools.

PHARMACEUTICAL PROCESS CHEMISTRY (MPC 204T)

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPC204T. 1K	Classify various safety techniques
MPC204T. 2K	Discuss and relate various unit processes
MPC204T. 3K	Discuss and relate various unit operations in process chemistry
MPC204T. 4K	Illustrate unit process for different types of reactions
MPC204T.	Explain and differentiate various reaction kinetics , reaction routes and techniques

5K	of fermentation
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PHARMACEUTICAL CHEMISTRY PRACTICALS – II-MPC205P

CO Number	Course Outcomes: Upon completion of course students will be able to –
MPL 205P.1S	measure the strength of drug by using various bioassay techniques
MPL 205P.2S	design, analysed and interpret the general toxicological testing protocols and report (including of acute and chronic) in preclinical research
MPL 205P.3S	designed various clinical documents such as clinical trial protocol, Case Report Forms, Adverse drug reaction monitoring and reporting
MPL 205P.4S	Skill to designed and execute the studies based on drug absorption as well as to plan alternative methods to animal toxicity testing including of in-silico based studies.
MPL 205P.5S	design and perform drug mutagenicity study using mice bone-marrow chromosomal aberration test
MPL 205P.6S	analysed various Serum biochemical, haematological, urine analysis, functional observation tests and histological studies in various preclinical studies.

M.PHARM

SEM III

MRM 301T: Research Methodology and Biostatistics

CO Number	Course Outcomes: Upon completion of course students will be able to –
MRM- 301T.1K	Discuss the various aspects of research methodology such as literature survey, sampling methods, report writing etc.
MRM- 301T.2K	Compare the various statistical techniques and their applications
MRM- 301T.3K	Choose the appropriate parametric/ non parametric tests as per the data, solve manually as well as using statistical software.
MRM- 301T.4K	Elaborate with examples the ethics involved in medical research.
MRM- 301T.5K	Interpret the guidelines of CPCSEA for laboratory animal facilities and basic principles of medical research
MRM- 301T.6K	Discuss the principles and importance of Helsinki

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