

# PHARMACEUTICAL CHEMISTRY

B.Sc. (Honours) — 4-Year Programme | NCrF Levels 4.5 → 6.0

Semester-wise Course & Lab Listing — CCFUP Corrected Master (R1805-Rev1)

Vasantrao Naik Mahavidyalaya (Autonomous), Chhatrapati Sambhajnagar |

## Programme Overview

Each semester table lists all theory courses and labs together. Lab rows (shaded blue for DSC Labs, green for Minor Labs) display linked courses and all 10 lab exercises. Exercise 10 in every semester is the integrated OSPE examination. Semester VIII is structured as two mutually exclusive exit tracks per NEP 2020 and NCrF CCFUP requirements; students elect one track and complete only that track's courses.

## Year I — Semesters I & II (NCrF Level 4.5)

Semester I | Year I | NCrF Level 4.5

Theory: 19 Cr | Labs: 2 Cr | Total: 21 Cr

Code	Course Title	Category	L-T-P	Cr	NOS / NSQF	SDGs
PHC-DSC-101	Inorganic and Physical Chemistry I	DSC	3-0-0	3	SSC/N2601; SSC/N2603	SDG 3, 9
PHC-DSC-102	Fundamentals of Analytical Chemistry	DSC	3-0-0	3	SSC/N2601; SSC/N2608	SDG 3, 9
PHC-MOD-101	Mathematics for Chemistry	MDC	3-0-0	3	SSC/N8501; SSC/N2608	SDG 4, 9
PHC-AEC-101	English Communication for Science	AEC	2-0-0	2	SSC/N2608	SDG 4
PHC-VAC-101	Environmental Science — Water Conservation	VAC	2-0-0	2	SSC/N2607; IKS/N0101	SDG 6, 13
PHC-SEC-101	Laboratory Safety and GLP	SEC	1-0-4	3	SSC/N2601; SSC/N2611	SDG 3, 8

<b>PHC-MIN-101</b>	Minor Track — Course I (Stream A/B/C)	<b>Minor</b>	3-0-0	<b>3</b>	SSC/N2601	SDG 4, 9
<b>PHC-LAB-101</b>	Inorganic, Physical & Analytical Chemistry Lab ← links: PHC-DSC-101 + PHC-DSC-102	<b>DSC Lab</b>	0-0-4	<b>2</b>	SSC/N2601; SSC/N2603	SDG 3, 9
<b>Exercises</b>	(1) Acid-Base Titration — Standardisation of NaOH (2) Complexometric Titration — Water Hardness by EDTA (3) Permanganometric Titration — Fe <sup>2+</sup> Estimation (4) Gravimetric Analysis — Estimation of BaSO <sub>4</sub> (5) Spectrophotometric Estimation — Iron by Thiocyanate (6) Preparation of Potash Alum (7) pH-Metric Titration — Buffer Capacity (8) Viscosity of Liquids — Ostwald Viscometer (9) TLC — Identification of Drug Mixtures (10) OSPE — Integrated Practical Exam					
<b>TOTAL</b>	Theory: 19 Cr   Labs: 2 Cr	<b>Grand Total: 21 Credits</b>				

**Lab Note:** DSC Lab only. No Minor Lab in Semester I. Minor theory commences in Sem I; Minor Lab starts from Sem III.

**Semester II | Year I | NCrf Level 4.5**

**Theory: 21 Cr | Labs: 2 Cr | Total: 23 Cr**

Code	Course Title	Category	L-T-P	Cr	NOS / NSQF	SDGs
<b>PHC-DSC-201</b>	Organic Chemistry I — Mechanisms and Stereochemistry	<b>DSC</b>	3-0-0	<b>3</b>	SSC/N2603; SSC/N2605	SDG 3, 9
<b>PHC-DSC-202</b>	Pharmaceutical Inorganic Chemistry	<b>DSC</b>	3-0-0	<b>3</b>	SSC/N2604; SSC/N2601	SDG 3, 9
<b>PHC-MOD-201</b>	Programming for Chemistry (Python / R)	<b>MDC</b>	2-0-2	<b>3</b>	SSC/N8501; SSC/N2608	SDG 4, 9

<b>PHC-AEC-201</b>	Regional Language Proficiency — Marathi	<b>AEC</b>	2-0-0	<b>2</b>	SSC/N2608	SDG 4
<b>PHC-VAC-201</b>	Indian Knowledge Systems in Pharmaceutical Science	<b>VAC</b>	2-0-0	<b>2</b>	IKS/N0101	SDG 3, 4
<b>PHC-DSC-203</b>	Pharmaceutical Calculations and Stoichiometry	<b>DSC</b>	3-0-0	<b>3</b>	SSC/N2602; SSC/N2601	SDG 3, 8
<b>PHC-OJT-201</b>	Internship — Lab Orientation (MASSIA Member Labs)	<b>OJT</b>	0-0-4	<b>2</b>	SSC/N2601; SSC/N2611; SSC/N2602	SDG 8, 9
<b>PHC-MIN-201</b>	Minor Track — Course II (Stream A/B/C)	<b>Minor</b>	3-0-0	<b>3</b>	SSC/N2601	SDG 4, 9
<b>PHC-LAB-201</b>	Organic Chemistry & Pharmaceutical Inorganic Lab ← links: PHC-DSC-201 + PHC-DSC-202	<b>DSC Lab</b>	0-0-4	<b>2</b>	SSC/N2603; SSC/N2604	SDG 3, 9
<b>Exercises</b>	(1) Functional Group Identification — Organic QA (2) Preparation of Aspirin (3) Preparation of p-Nitroaniline from Acetanilide (4) Iodometric Estimation — Ascorbic Acid (5) Complexometric Assay — Calcium Gluconate Injection (6) Antacid Neutralisation Capacity (7) Preparation of Benzanilide (8) Colorimetric Estimation of Phosphate (9) Identification of Pharmaceutical Excipients (10) OSPE — Integrated Practical Exam					
<b>TOTAL</b>	Theory: 21 Cr   Labs: 2 Cr	<b>Grand Total: 23 Credits</b>				

**Lab Note:** DSC Lab only. No Minor Lab in Semester II. OJT-201 is a lab-credit internship at MASSIA member labs.

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## Year II — Semesters III & IV (NCrF Level 5.0)

Semester III | Year II | NCrF Level 5.0

Theory: 19 Cr | Labs: 4 Cr | Total: 23 Cr

Code	Course Title	Category	L-T-P	Cr	NOS / NSQF	SDGs
PHC-DSC-301	Inorganic and Physical Chemistry II	DSC	3-1-0	4	SSC/N2603; SSC/N2601	SDG 3, 9, 13
PHC-DSC-302	Physical Pharmaceutics I	DSC	3-1-0	4	SSC/N2604; SSC/N2601	SDG 3, 9
PHC-MOD-301	Statistics and Chemometrics	MDC	3-0-0	3	SSC/N2608; SSC/N2609	SDG 9, 12
PHC-VAC-301	Digital and Technological Solutions in Pharma	VAC	2-0-0	2	SSC/N8501; SSC/N2609	SDG 4, 9
PHC-SEC-301	Instrumentation Handling and Calibration	SEC	1-0-4	3	SSC/N2601; SSC/N2611	SDG 9, 12
PHC-MIN-301	Minor Track — Course III (Stream A/B/C)	Minor	3-0-0	3	SSC/N2601	SDG 4, 9
PHC-LAB-301	Physical Chemistry, Pharmaceutics & Chemometrics Lab ← links: PHC-DSC-301 + PHC-DSC-302	DSC Lab	0-0-4	2	SSC/N2603; SSC/N2604	SDG 3, 9
PHC-MLAB-301	Minor Stream Lab I — Introduction & Techniques ← links: PHC-MIN-101 + PHC-MIN-201	Minor Lab	0-0-4	2	SSC/N2601	SDG 4, 9

<b>Exercises</b>	(1) Conductometric Titration (2) pKa Determination — pH-Metric (3) Spectrophotometric Kinetics — Crystal Violet Fading (4) Viscosity — Brookfield Viscometer (5) Surface Tension & CMC — Du Noüy Ring (6) Partition Coefficient (log P) (7) Emulsion Stability Testing (8) EMF Measurement — Electrochemical Series (9) Adsorption Isotherm — Freundlich & Langmuir (10) OSPE — Integrated Practical Exam
<b>Minor Lab Exercises</b>	Stream A: Plant extraction, TLC, phytochemical screening, UV marker identification Stream B: Aseptic technique, media prep, streak plating, colony counting, inoculum development Stream C: SOP writing, gap analysis, FMEA quality risk matrix — 6 stream practicals + 3 joint instrument sessions + OSPE
<b>TOTAL</b>	Theory: 19 Cr   Labs: 4 Cr

**Grand Total:  
23  
Credits**

**Lab Note:** 2 Cr DSC Lab + 2 Cr Minor Lab = 4 Lab Cr. ✓ Minor Lab I commences (Stream A / B / C).

**Semester IV | Year II | NCrF Level 5.0**

**Theory: 19 Cr | Labs: 4 Cr | Total: 23 Cr**

Code	Course Title	Category	L-T-P	Cr	NOS / NSQF	SDGs
PHC-DSC-401	Organic Chemistry II — Functional Groups and Reactions	DSC	3-0-0	3	SSC/N2603; SSC/N2605	SDG 3, 9
PHC-DSC-402	Molecular Spectroscopy and Analysis	DSC	3-0-0	3	SSC/N2601; SSC/N2608	SDG 3, 9
PHC-MOD-401	Quality Management — QC, QA and GMP	MDC	3-0-0	3	SSC/N2611; SSC/N2601	SDG 3, 9, 17

<b>PHC-AEC-401</b>	Technical Writing for Pharmaceutical Sciences	<b>AEC</b>	2-0-0	<b>2</b>	SSC/N2608	SDG 4, 17
<b>PHC-SEC-401</b>	Document Control and Audit Readiness	<b>SEC</b>	2-1-0	<b>3</b>	SSC/N2611; SSC/N2601	SDG 3, 9
<b>PHC-OJT-401</b>	Internship — Industrial Immersion (AURIC Shop-Floor)	<b>OJT</b>	0-0-4	<b>2</b>	SSC/N2601; SSC/N2611; SSC/N2602	SDG 8, 9, 17
<b>PHC-MIN-401</b>	Minor Track — Course IV (Stream A/B/C)	<b>Minor</b>	3-0-0	<b>3</b>	SSC/N2601	SDG 4, 9
<b>PHC-LAB-401</b>	Organic Spectroscopy & Quality Management Lab ← links: PHC-DSC-401 + PHC-DSC-402	<b>DSC Lab</b>	0-0-4	<b>2</b>	SSC/N2603; SSC/N2608	SDG 3, 9
<b>PHC-MLAB-401</b>	Minor Stream Lab II — Applied Methods ← links: links: PHC-MIN-301 + PHC-MIN-401	<b>Minor Lab</b>	0-0-4	<b>2</b>	SSC/N2601	SDG 4, 9
<b>Exercises</b>	(1) IR Spectroscopy — Functional Group Identification (2) UV Spectroscopy — Calibration & Quantitative Analysis (3) Aldol Condensation — Dibenzalacetone Synthesis (4) Esterification — Ethyl Benzoate + <sup>1</sup> H NMR Simulation (5) HPLC Analysis — Paracetamol Tablet Assay (6) GC Analysis — Residual Solvents (ICH Q3C) (7) Synthesis of Sulphanilamide (8) Spectral Elucidation — Unknown Compound (9) QMS Documentation — SOP Writing & Deviation Report (10) OSPE — Integrated Practical Exam					
<b>Minor Lab Exercises</b>	Stream A: HPTLC standardisation, column chromatography, pharmacopoeial limit tests, DoE yield optimisation Stream B: Enzyme kinetics (Km/Vmax), fermentation growth, downstream primary recovery (AS fractionation) Stream C: HPLC method development for pharma active, forced degradation, ICH Q2 validation — 6 stream practicals + 2 cross-stream + 1 DoE + OSPE					
<b>TOTAL</b>	Theory: 19 Cr   Labs: 4 Cr		<b>Grand Total: 23 Credits</b>			

**Lab Note:** 2 Cr DSC Lab + 2 Cr Minor Lab = 4 Lab Cr. ✓ OJT-401 Industrial Immersion at AURIC Shop-Floor (2 Cr).

## Year III — Semesters V & VI (NCrF Level 5.5)

Semester V | Year III | NCrF Level 5.5

Theory: 19 Cr | Labs: 2 Cr | Total: 21 Cr

Code	Course Title	Category	L-T-P	Cr	NOS / NSQF	SDGs
PHC-DSC-501	Medicinal Chemistry I — SAR Principles	DSC	3-1-0	4	SSC/N2605; SSC/N2603	SDG 3, 9
PHC-DSC-502	Pharmaceutical Engineering — Heat and Mass Transfer	DSC	3-1-0	4	SSC/N2607; SSC/N2601	SDG 3, 7, 9
PHC-DSE-501	Pharmaceutical Jurisprudence (Elective-1)	DSE	3-0-0	3	SSC/N2611; SSC/N2612	SDG 3, 16, 17
PHC-MOD-501	Data Science for Pharmaceutical Chemistry (AI/ML)	MDC	2-0-2	3	SSC/N8501; SSC/N2609	SDG 3, 9
PHC-AEC-501	Scientific Data Literacy and Research Communication	AEC	2-0-0	2	SSC/N2608; SSC/N2609	SDG 4, 9, 17
PHC-MIN-501	Minor Track — Course V (Stream A/B/C)	Minor	3-0-0	3	SSC/N2601	SDG 4, 9
PHC-LAB-501	Medicinal Chemistry, Pharmaceutical Engineering & AI/ML Lab ← links: PHC-DSC-501 + PHC-DSC-502	DSC Lab	0-0-4	2	SSC/N2605; SSC/N2607	SDG 3, 9

<b>Exercises</b>	(1) Physicochemical Profiling — Lipinski Filter (RDKit) (2) Molecular Docking — Paracetamol/Ibuprofen vs COX-2 (AutoDock Vina) (3) QSAR Model Building — Antibacterial Activity (4) Material Balance — Crystallisation Process (5) Heat Transfer — LMTD Calculation for Shell & Tube HEX (6) Fluid Flow — Reynolds Number and Pump Selection (7) Pharmacophore Modelling — Antihistamine Series (8) Distillation — McCabe-Thiele Graphical Design (9) Process Scale-Up — Dimensionless Number Analysis (10) OSPE — Integrated Practical Exam
<b>TOTAL</b>	Theory: 19 Cr   Labs: 2 Cr

**Grand Total:  
21  
Credits**

**Lab Note:** DSC Lab only (PHC-LAB-501, 2 Cr). No Minor Lab in Sem V. ★CORRECTED: Grand Total = 21 Cr (previous erroneous TOTAL row stated 26 Cr).

**Semester VI | Year III | NCrF Level 5.5**

**Theory: 18 Cr | Labs: 4 Cr | Total: 22 Cr**

Code	Course Title	Category	L-T-P	Cr	NOS / NSQF	SDGs
PHC-DSC-601	Green Chemistry and Sustainable Synthesis	DSC	3-1-0	4	SSC/N2603; SSC/N2607	SDG 9, 12, 13
PHC-DSC-602	Pollution Control and Zero Liquid Discharge (ZLD)	DSC	3-0-0	3	SSC/N2607; SSC/N2611	SDG 6, 9, 13
PHC-DSC-603	Natural Products and Herbal API Sourcing	DSC	3-0-0	3	SSC/N2605; SSC/N2603	SDG 3, 8, 15
PHC-DSE-601	Regulatory Affairs and Intellectual Property Rights	DSE	3-0-0	3	SSC/N2612; SSC/N2611	SDG 3, 9, 17

<b>PHC-VAC-601</b>	Pharmaceutical Entrepreneurship & Startup Ecosystem	<b>VAC</b>	2-0-0	<b>2</b>	SSC/N2612 SSC/N2611 SSC/N2609	SDG 8, 9, 17
<b>PHC-MIN-601</b>	Minor Track — Course VI (Stream A/B/C)	<b>Minor</b>	3-0-0	<b>3</b>	SSC/N2601	SDG 4, 9
<b>PHC-LAB-601</b>	Green Chemistry, ZLD & Natural Products Lab ← links: PHC-DSC-601 + PHC-DSC-602 + PHC-DSC-603	<b>DSC Lab</b>	0-0-4	<b>2</b>	SSC/N2603; SSC/N2607	SDG 9, 12, 13
<b>PHC-MLAB-601</b>	Minor Stream Lab III — Advanced Applications ← links: PHC-MIN-501 + PHC-MIN-601	<b>Minor Lab</b>	0-0-4	<b>2</b>	SSC/N2601	SDG 4, 9
<i>Exercises</i>	(1) Microwave-Assisted Green Synthesis of Aspirin (2) Solvent-Free Aldol Condensation — Ball Milling (3) Effluent Characterisation — BOD <sub>5</sub> , COD, TDS (4) Coagulation-Flocculation Jar Test (5) Phytochemical Screening — Soxhlet Extraction of Neem (6) HPTLC Standardisation — Curcumin in Turmeric (7) Membrane Filtration — RO/NF for Effluent Treatment (8) Enzyme-Catalysed Green Synthesis — Lipase Esterification (9) Ashwagandha Withanolide Extraction — Comparative Solvents (10) OSPE — Integrated Practical Exam					
<i>Minor Lab Exercises</i>	Stream A: MTT cytotoxicity assay, CYP inhibition herb-drug interaction, DPPH/FRAP antioxidant activity Stream B: Enzyme immobilisation (CLEAs), biocatalytic esterification, GFP expression in E. coli / SDS-PAGE Stream C: CTD Module 3 dossier fragment, regulatory checklist, PV ADR Vigiflow simulation, MedDRA coding — 6 practicals + 2 computational + 1 industry simulation + OSPE					
<b>TOTAL</b>	Theory: 18 Cr   Labs: 4 Cr	<b>Grand Total: 22 Credits</b>				

**Lab Note:** 2 Cr DSC Lab + 2 Cr Minor Lab = 4 Lab Cr. ✓ Minor track (Sems I–VI) completes at 24 Cr exactly — CCFUP compliant.

## Year IV — Semester VII (NCrF Level 6.0)

Semester VII | Year IV | NCrF Level 6.0

Theory: 19 Cr | Labs: 4 Cr | Total: 23 Cr

Code	Course Title	Category	L-T-P	Cr	NOS / NSQF	SDGs
PHC-DSC-701	Advanced Synthetic Organic Chemistry	DSC	3-1-0	4	SSC/N2603; SSC/N2605	SDG 3, 9
PHC-DSC-702	Advanced Medicinal Chemistry	DSC	3-0-0	3	SSC/N2605; SSC/N2603	SDG 3, 9
PHC-DSC-703	Biopharmaceuticals and Biocatalysis	DSC	3-0-0	3	SSC/N2606; SSC/N2603	SDG 3, 9
PHC-DSE-701A/ 701B	Advanced Elective (Options A/B)	DSE	3-0-0	3	SSC/N2606; SSC/N2611; SSC/N2605	SDG 3, 9, 17
PHC-MIN-701	Minor Track — Course VII (Stream A/B/C)	Minor	3-0-0	3	SSC/N2601	SDG 4, 9
PHC-OGE-701	Open Generic Elective (OGE-701A/B/C)	OG/GE	3-0-0	3	SSC/N2605; SSC/N2601	SDG 3, 9
PHC-LAB-701	Advanced Synthesis & Biopharmaceuticals Lab ← links: PHC-DSC-701 + PHC-DSC-703	DSC Lab	0-0-4	2	SSC/N2603; SSC/N2606	SDG 3, 9
PHC-MLAB-701	Minor Stream Lab IV — Honours Research Practicum ← links: PHC-MIN-701	Minor Lab	0-0-4	2	SSC/N2601	SDG 4, 9

<b>Exercises</b>	<p>(1) Wittig Reaction — Synthesis of trans-Stilbene</p> <p>(2) Grubbs Metathesis — Ring-Closing Metathesis</p> <p>(3) Asymmetric Synthesis — CBS Reduction</p> <p>(4) Biocatalysis — Lipase Kinetic Resolution</p> <p>(5) Protein Quantification and SDS-PAGE</p> <p>(6) ELISA — Quantification of Recombinant Protein</p> <p>(7) Multi-Step Synthesis — Ibuprofen BHC Route</p> <p>(8) Fermentation — Bacterial Enzyme Production</p> <p>(9) Flow Chemistry — Diels-Alder in Microreactor</p> <p>(10) OSPE — Integrated Practical Exam</p>	
<b>Minor Lab Exercises</b>	<p>Stream A: Supervised Marathwada plant extraction, GMP herbal batch documentation, anti-microbial activity, PK simulation (log P/pKa)</p> <p>Stream B: Bench-top 2L bioreactor — fed-batch, DO/pH control, PAT inline monitoring, DSP: IMAC chromatography, batch record documentation</p> <p>Stream C: Full mock ANDA dossier — Module 3 quality sections, BE synopsis, eCTD folder structure, peer review — 8 Honours practicals + OSPE</p>	
<b>TOTAL</b>	Theory: 19 Cr   Labs: 4 Cr	<b>Grand Total: 23 Credits</b>

**Lab Note:** 2 Cr DSC Lab + 2 Cr Minor Lab = 4 Lab Cr. ✓ Minor VII and Minor Lab IV extend the honours practicum; Open Generic Elective-701 provides interdisciplinary breadth.

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## Year IV — Semester VIII (NCrF Level 6.0) | Dual-Track Exit

**IMPORTANT:** Students elect ONE track only. Track A leads to the B.Sc. (Honours) with Research designation; Track B leads to the B.Sc. (Honours) designation. Both tracks share the same core courses (PHC-DSC-801, PHC-DSC-802, PHC-SEC-801, PHC-LAB-801) and the same computational laboratory exercises. The Dissertation (Track A) and Capstone Project (Track B) are mutually exclusive deliverables.

### SEMESTER VIII — TRACK A : Honours with Research (Dissertation) | NCrF Level 6.0 | Total: 19 Credits

Code	Course Title	Category	L-T-P	Cr	NOS / NSQF	SDGs
PHC-DSC-801	Emerging Trends in Pharmaceutical Sciences	DSC	3-0-0	3	SSC/N2605; SSC/N2609	SDG 3, 9
PHC-DSC-802	Computational Chemistry and QSAR	DSC	2-0-2	3	SSC/N2609; SSC/N2605	SDG 3, 9
PHC-SEC-801	Drug Regulatory Affairs and Submission Strategy	SEC	3-0-0	3	SSC/N2611; SSC/N2612; SSC/N2605	SDG 3, 9, 17
PHC-RES-801	Honours Research Project / Dissertation	Research	0-0-16	8	SSC/N8601; SSC/N2603; SSC/N2605	SDG 3, 9, 17
PHC-LAB-801	Computational Chemistry & Emerging Technologies Lab ← links: PHC-DSC-801 + PHC-DSC-802	DSC Lab	0-0-4	2	SSC/N2609; SSC/N2605	SDG 3, 9

<b>Exercises</b>	(1) Structure-Based Virtual Screening — SARS-CoV-2 Mpro (AutoDock Vina) (2) Molecular Dynamics — Ligand Stability in COX-2 (GROMACS) (3) 2D-QSAR Modelling — Antidiabetic Compounds (RDKit / scikit-learn) (4) ML Drug Property Prediction — Tox21 (DeepChem / GraphConv) (5) AlphaFold2 Protein Structure Prediction & Validation (6) Pharmacophore Validation — HIV-1 Protease (LigandScout) (7) mRNA Secondary Structure Optimisation (RNAfold) (8) Binding Free Energy — MM-PBSA for Hit Compound (9) AI Molecular Generation — SMILES VAE/LSTM (10) OSPE — Honours Integrated Practical Exam	
<b>TOTAL</b>	Theory: 14 Cr   Labs: 2 Cr	<b>Grand Total: 19 Credits</b>

**Lab Note:** Track A: PHC-RES-801 (Dissertation, 8 Cr, 0-0-16) replaces Capstone Project, OGE and DSE elective. Total = DSC-801(3) + DSC-802(3) + SEC-801(3) + RES-801(8) + LAB-801(2) = 19 Cr ✓ ≤ 22 Cr ceiling.

**SEMESTER VIII — TRACK B : Regular Honours / Industry-Readiness (Non-Research) | NCrf Level 6.0 | Total: 21 Credits**

Code	Course Title	Category	L-T-P	Cr	NOS / NSQF	SDGs
PHC-DSC-801	Emerging Trends in Pharmaceutical Sciences	DSC	3-0-0	3	SSC/N2605; SSC/N2609	SDG 3, 9
PHC-DSC-802	Computational Chemistry and QSAR	DSC	2-0-2	3	SSC/N2609; SSC/N2605	SDG 3, 9
PHC-SEC-801	Drug Regulatory Affairs and Submission Strategy	SEC	3-0-0	3	SSC/N2611; SSC/N2612; SSC/N2605	SDG 3, 9, 17

<b>PHC-OGE-801</b>	Open Generic Elective (OGE-801D or OGE-801 E or OGE-801F )	<b>OG/GE</b>	3-0-0	<b>3</b>	SSC/N2601	SDG 4, 9
<b>PHC-DSE-801A</b>	Advanced Specialisation Elective (DSE-801A/B/C/D/E)	<b>DSE</b>	3-0-0	<b>3</b>	SSC/N2606; SSC/N2611; SSC/N2605	SDG 3, 9, 17
<b>PHC-Proj-801</b>	Honours Capstone Project	<b>Project</b>	0-0-8	<b>4</b>	SSC/N8601; SSC/N2603; SSC/N2605	SDG 3, 9, 17
<b>PHC-LAB-801</b>	Computational Chemistry & Emerging Technologies Lab ← links: PHC-DSC-801 + PHC-DSC-802	<b>DSC Lab</b>	0-0-4	<b>2</b>	SSC/N2609; SSC/N2605	SDG 3, 9
<b>Exercises</b>	<p>(1) Structure-Based Virtual Screening — SARS-CoV-2 Mpro (AutoDock Vina)</p> <p>(2) Molecular Dynamics — Ligand Stability in COX-2 (GROMACS)</p> <p>(3) 2D-QSAR Modelling — Antidiabetic Compounds (RDKit / scikit-learn)</p> <p>(4) ML Drug Property Prediction — Tox21 (DeepChem / GraphConv)</p> <p>(5) AlphaFold2 Protein Structure Prediction &amp; Validation</p> <p>(6) Pharmacophore Validation — HIV-1 Protease (LigandScout)</p> <p>(7) mRNA Secondary Structure Optimisation (RNAfold)</p> <p>(8) Binding Free Energy — MM-PBSA for Hit Compound</p> <p>(9) AI Molecular Generation — SMILES VAE/LSTM</p> <p>(10) OSPE — Honours Integrated Practical Exam</p>					
<b>TOTAL</b>	Theory: 15 Cr   Labs: 2 Cr	<b>Grand Total: 21 Credits</b>				

**Lab Note:** Track B: PHC-Proj-801 Capstone Project (4 Cr, 0-0-8) is the terminal deliverable. OGE-801 provides interdisciplinary elective breadth; DSE-801A deepens specialisation. Total = DSC-801(3) + DSC-802(3) + SEC-801(3) + OGE-801(3) + DSE-801A(3) + Proj-801(4) + LAB-801(2) = 21 Cr ✓ ≤ 22 Cr ceiling.

## Programme Credit Architecture Matrix

Cumulative credit totals across all eight semesters, validated against NCrF CCFUP category mandates. Minor Track credits close at Semester VI (24 Cr). The Semester VII Minor extension (PHC-MIN-701 + PHC-MLAB-701 = 5 Cr) is an additional honours-level practicum beyond the mandated 24-Cr baseline.

Category	CCFUP Mandate	3-Yr UG (Sem I–VI)	4-Yr Track A(Research)	4-Yr Track B(Non-Research)	Compliance
DSC + DSC Lab +DSE	≥ 50% of total	65 Cr	88 Cr	91 Cr	✓ Compliant
DSE	Specialisation field	(6 Cr)	(9 Cr)	(12 Cr)	✓ Compliant
MDC	Exactly 9 Cr	9 Cr	9 Cr	9 Cr	✓ Exactly 9 Cr
AEC	Exactly 8 Cr	8 Cr	8 Cr	8 Cr	✓ Exactly 8 Cr
VAC	Exactly 8 Cr	8 Cr	8 Cr	8 Cr	✓ Exactly 8 Cr
SEC	Professional skills, 3 Cr each	9 Cr	12 Cr	12 Cr	✓ Compliant
OJT / Internship	≥ 2 Cr (3-yr); ≥ 4 Cr (4-yr)	4 Cr	4 Cr	4 Cr	✓ Compliant
Minor Track + Lab	Exactly 24 Cr (Yr 1–3, Sem I–VI)	24 Cr	24 Cr	24 Cr	✓ Exactly 24 Cr
Minor Track VII (Sem VII)	Extended / Honours Practicum	—	5 Cr (extra)	5 Cr (extra)	Sem VII Extension
OG / GE	Open Generic Elective	—	3 Cr (Sem VII)	3 Cr (Sem VII) + 3 Cr (Sem VIII)	✓ Compliant
Research / Dissertation	Track A: ≥ 8 Cr	—	8 Cr	—	✓ Track A
Capstone Project	Track B: ≥ 4 Cr	—	—	4 Cr	✓ Track B
PROGRAMME TOTAL	120–140 Cr (3-yr); 160–180 Cr (4-yr)	127 Cr	~169 Cr	~171 Cr	✓ Within NCrF Band

