1. **Title of the module**
   Drug Discovery Module – GSKCHEM4
2. **School or partner institution which will be responsible for management of the module**
   GSK
3. **The level of the module (Level 4, Level 5, Level 6 or Level 7)**
   HE Level 4 / NQF Level 7
4. **The number of credits and the ECTS value which the module represents**
   10 credits
5. **Which term(s) the module is to be taught in (or other teaching pattern)**
   Autumn
6. **Prerequisite and co-requisite modules**
   None
7. **The programmes of study to which the module contributes**
   This is an optional module for the Postgraduate Certificate in Professional Development.
8. **The intended subject specific learning outcomes.**
   **On successfully completing the module students will be able to:**
   - **Introduction to Drug Discovery**
     8.1 Articulate the overall Drug Discovery process, from early hit identification through to a marketed drug.
     8.2 Understand how the Drug Discovery process manifests itself within GSK.
     8.3 Use the appropriate terminology in discussion.
   - **Principles in Medicinal Chemistry Parts 1 & 2**
     8.4 Know the processes involved in the generation and optimisation of a “Hit”.
     8.5 Understand the criteria that define a good “Lead”, including developability enablers.
     8.6 Understand the Lead Optimisation process.
     8.7 Appreciate the properties which lead to improved ‘drug-like’ molecules.
     8.8 Be comfortable utilising the concepts learnt and applying them in day-to-day work.
   - **Principles in Drug Discovery**
     8.9 Recognise the value of Computational Chemistry in the Drug Discovery process.
     8.10 Be aware of the different types of molecular modelling available and their strengths/weaknesses.
     8.11 Have a good understanding of computational chemistry techniques and the ability to apply them appropriately.
   - **Patents**
     8.12 Understand the process involved in patenting pharmaceutical agents.
     8.13 Appreciate the issues involved with Intellectual Property.
     8.14 Understand the nomenclature such that it can be accurately used in work.
   - **Drug Development**
     8.15 Be aware of the key phases of Drug Development and what is involved in each (A1, A3, B1b, B1h).
     8.16 Understand the concept of a molecule’s ‘Medicine Vision’ and how it will bring value to the lives of patients.
     8.17 Be comfortable using the language associated with late-stage drug development and apply it appropriately.
8.18 Know which key Target Classes are the subject of research by GSK, and the rationale for this focus.
8.19 Appreciate the types of assay run, how they are set up, and how the data generated should be interpreted.
8.20 Have an understanding of phenotypic based Drug Discovery; its strengths and weaknesses.
8.21 Understand the key terms and concepts used in assay development and use them in the correct context.

DMPK & ADME
8.22 Understand the vital importance of pharmacokinetics and metabolism in Drug Discovery.
8.23 Appreciate the importance of pharmacodynamics and its relationship to PK.
8.24 Understand the importance of safety/toxicology and therapeutic window.
8.25 Have a solid understanding of DMPK/ADME concepts such that they can be applied to impact project.

Non-Small Molecule Drug Discovery & Biopharmaceuticals
8.26 Appreciate alternative modes of therapeutic intervention (other than small molecule) used by GSK, and others, to treat patients.
8.27 Comprehend why non-small molecule approaches may be more suitable than traditional small molecule Drug Discovery in some instances.
8.28 Have a general understanding of the mode of action of non-small molecule medicines.

Case Histories
8.29 Have an appreciation of how the different areas of Drug Discovery work together to deliver a successful Drug Discovery programme.
8.30 Appreciate that not all Drug Discovery efforts are the same and that programme strategy is context specific.
8.31 Based on learning throughout the course, can follow the case histories and understand the approaches taken to deliver drug molecules.

9. The intended generic learning outcomes.
On successfully completing the module students will be able to:

9.1 Discuss the overall Drug Discovery Process, in general and specifically at GSK (A1, A3, B1b).
9.2 Identify which Key Target Classes are the subject of research by GSK, and the rationale for this focus (A1, A3).
9.3 Understand the processes involved in the generation and optimisation of a “Hit” (A1, A3, B1b, B1c).
9.4 Demonstrate knowledge of the criteria that define a good “Lead”, including developability enablers (A1, A3, B1b, B1c).
9.5 Show a good appreciation of the Lead Optimisation Process (A1, A3, B1b, B1c).
9.6 Recognise the value of Computational Chemistry in the Drug Discovery Process (A1, A3, B1b, B1h, Cm, Cn, Co, Cs, Ct); this is integrated into several lectures.
9.7 Comprehend key importance of pharmacokinetics, metabolism and safety to Drug Discovery (A1, A3, B1b, B1h, Cm, Cn, Co, Cs, Ct).
9.8 Explain the key phases of Drug Development and what is involved in each (A1, A3, B1b, B1h, Cm, Cn, Co, Cs, Ct).
9.9 Appreciate the issues involved with Intellectual Property (A1, A3, B1h, Co, Ct).

10. A synopsis of the curriculum
The module provides a continuing framework of learning for new staff entering the company, primarily recent Chemistry graduates. However, it is also suitable for those who have more industrial experience, but who wish to refresh and build on their knowledge and appreciation of synthetic chemistry. This group may include staff who initially joined the company without a first degree, but who have achieved an equivalent qualification by part time study.

11. **Reading list (Indicative list, current at time of publication. Reading lists will be published annually)**

- Lecture notes and tutorial questions are normally made available in advance of each session. Further study of the subject is encouraged and this will improve the participant’s skills in efficient and effective literature retrieval and extraction of information.
- For most lectures of the module, a relevant textbook is recommended and references to recent literature are provided by the speaker. Here are some examples:
  - Computational Chemistry: G H Grant & W G Richards; *Oxford University Press, 2004*.
  - Introduction to Drug Metabolism; G. G. Gibson, P. Skett, *Nelson Thornes, 2001*.
  - Comprehensive Medicinal Chemistry; C. Hansch *et al., Pergamon Press, 1990*.
  - The attendees also have the opportunity to attend in-house symposia, focussing on aspects of drug discovery within GSK research; external conferences including drug discovery and medicinal chemistry presentations from other pharmaceutical organisations.
  - All participants are encouraged to discuss session topics with their supervisor, other participants/chemists or mentors.

12. **Learning and teaching methods**

This module will be taught by means of lectures delivered by internal GSK experts. Based on programme participant performance, this method of delivery has proved very successful.

Independent learning hours will include literature searching, private study and assessment work.

Learning hours: 100

13. **Assessment methods**

13.1 Main assessment methods
Successful completion of the module will require the participant to pass both a written report and a *viva voce* examination.

The participant will be required to write a report of 2500 words maximum (minimum 2000 words), including chemical structures where appropriate. This report will exemplify how material from at least two topics of the module have (or may have) impacted an ongoing GSK research programme and the implications. Cross-referencing to recently published literature and/or internal/external lectures will be required. This (and the *viva voce* – see below) report will be assessed by by two selected senior/experienced members of staff, who have a recognised track record in drug discovery and therefore a good appreciation of the level of knowledge and understanding we wish to assess.

The *viva voce* examination itself will involve a science-driven discussion during which, the participant will be asked to discuss a particular drug discovery topic or issue of their own choice (using visual aids, as required). Through thoughtful questioning of the topic and additional related areas, the assessor will seek to establish that the participant has the appropriate knowledge and understanding at Masters level. The participant will be expected to engage in a high-quality discussion rather than show adequate responses to a pre-set list of questions. This is an established practice at GSK.

Clear guidelines and training where appropriate, will be provided to the assessors on how to assess the report and conduct the *viva voce* examination, and the expected level of knowledge and understanding that the participant is required to demonstrate in order to pass the module. This will clearly be directly related to the Learning Outcomes described above.

The External Examiner will have access to:

- The participant’s report
- The participant’s visual aids for *viva voce* examination
- The examiner’s assessment summaries
- Any additional examples where the knowledge acquired has been applied in the workplace

14. *Map of module learning outcomes (sections 8 & 9) to learning and teaching methods (section12) and methods of assessment (section 13)*

<table>
<thead>
<tr>
<th>Module learning outcomes</th>
<th>8.1 – 8.31</th>
<th>9.1-9.9</th>
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<tbody>
<tr>
<td>Learning/teaching method</td>
<td>Hours allocated</td>
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<tr>
<td>Private Study</td>
<td>76</td>
<td>X</td>
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<tr>
<td>Lectures</td>
<td>24</td>
<td>X</td>
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<tr>
<td>Assessment method</td>
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<tr>
<td>Report</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Viva Voce</td>
<td>X</td>
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15. **Inclusive module design**

GSK recognises and has embedded the expectations of current equality legislation, by ensuring that the module is as accessible as possible by design. Additional alternative arrangements for students with Inclusive Learning Plans (ILPs)/declared disabilities will be made on an individual basis, in consultation with the relevant policies and support services.

The inclusive practices in the guidance (see Annex B Appendix A) have been considered in order to support all students in the following areas:

a) Accessible resources and curriculum

b) Learning, teaching and assessment methods

16. **Campus(es) or centre(s) where module will be delivered**

GSK Stevenage

17. **Internationalisation**

Drug Discovery Chemistry is an international subject with potential new medicines being discovered, developed and refined by multidisciplinary scientists across the globe. Mastery of the subject-specific learning outcomes will equip students to apply the theories and techniques of this module in a wide range of international contexts. GSK is large multi-national healthcare organisation which enables students to appreciate the international aspects and benefits of scientific research and development.

18. **Partner College/Validated Institution**

GSK Stevenage

19. **University School responsible for the programme**

Physical Sciences

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Revision record – all revisions must be recorded in the grid and full details of the change retained in the appropriate committee records.

<table>
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<tr>
<th>Date approved</th>
<th>Major/minor revision</th>
<th>Start date of the delivery of revised version</th>
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