School of Physics and Astronomy

Queen Mary University of London

Pro-forma to accompany coursework 2019/2020

Module Code: SPA6309 **Organiser:** Prof P R Hobson **Assessor:** Prof P R Hobson

Module Title: Radiation Detectors

Assessment Title: Reconstructing the Z boson from its decay to leptons in an experiment at a collider facility.

Weighting: 70%

Main objective of the assessment:

Students will demonstrate their ability to critically discuss the role and function of particle detector sub-systems used when reconstructing a fundamental particle in a General Purpose particle physics experiment at a colliding beam accelerator facility.

Brief Description of the assessment:

Students will write a short review of the experimental details of a named experiment in which an unstable fundamental particle is reconstructed from its decays to final state particles, in this case leptons.

The review will concentrate on the detection principles, operation and performance of sub-systems used to identify the final state particles and also those which may be used primarily to reduce the backgrounds from other final state particles unconnected with the primary event or which come from additional particles produced from the primary interaction or secondary particles associated with it.

Please note that this review is **not** intended to contain a discussion of the underlying fundamental particle physics of the production and decay of the Z boson.

Learning outcomes for the assessment:	**Assessment and marking criteria**
After completing this assignment you should be able to: ○ Understand how an unstable particle is reconstructed from final state particle signals from a range of radiation sensors ○ Extract from scientific publications key parameters that govern the specific performance of the detector sub systems used in a named experiment. ○ Write a concise and critical description of the function and operation of a range of radiation sensors with relevant references to refereed scientific publications.	You will be required to: Write a concise report in appropriate scientific language (format and length details below). Explain the basic particle detection principles of the key subsystems that are used to reconstruct the Z boson via its decays to leptons. Provide, with appropriate references, information about the key performance parameters of the sub-systems relevant to this study. Use appropriate figures (with references) to illustrate the performance of the sub-systems. An indicative marking scheme is appended below.

Assessment method by which a student can demonstrate learning outcomes:

Submit an *individual report*

Format for the assessment (Guidelines on the expected format and length of submission):

An individual report consisting of one cover page and then up to eight sides A4 **maximum**, **including figures & references**, and typed using a 12 point font (can be 10 point for figure captions and references). It should be submitted by the deadline provided to you below.

The cover page should contain the title of the assignment and your student number (not name) on it.

The report should be in PDF format.

IMPORTANT: any text/figures etc. beyond the 8th side of the main report will not be assessed!

Distribution date to students: Week of 24 February	**Submission Deadline:** 28 April 2020

Indicative Reading List:

As per the module reading list and links within individual lecture slides.

Further information:

I will provide the information about your individual allocated experiment via the module page during the week indicated in the "Distribution date" field above.

Indicative Marking Scheme

Criteria assessed	Contribution to overall mark
Clearly explained principles of detector subsystems used to identify and characterise the particles used in the Z boson reconstruction.	20%
Critical review of the performance of the detector subsystems described.	40%
Use of scientific writing style, numerical referencing and informative captions for figures and tables.	20%
Appropriately chosen references to published literature.	20%