# http://www.ric.edu/webcommunications/images/SealWithText_Small_Black.pngUNDERGRADUATE CURRICULUM COMMITTEE (UCC)PROPOSAL FORM

## Cover page roll over blue text to see further important [instructions](#instructions): please read.

**N.B. DO NOT USE HIGHLIGHT, JUST DELETE THE WORDS THAT DO NOT APPLY TO YOUR PROPOSAL**

**ALL numbers in section (A) need to be completed, including the impact ones.**

|  |  |  |
| --- | --- | --- |
| A.1. [Course or program](#Proposal) | **physics 307** |  |
| [Replacing](#Ifapplicable)  |  |  |
| A.2. [Proposal type](#type) | **Course: revision**  |  |
| A.3. [Originator](#Originator) | **Andrea Del Vecchio** | [Home department](#home_dept) | **Physical Sciences** |
| A.4. [Rationale](#Rationale) | **In order to prepare students for post-college work, we feel that this course should include quantum mechanics through the hydrogen atom, angular momentum and spin. However, that amount of content cannot be included in a three credit course. The increase to four credits would allow the inclusion of this material as well as the inclusion of some computational physics material. The course description will be updated to reflect the added materials.** |
| A.5. [Date submitted](#date_submitted) | **3/31/17** | A.6. [Semester effective](#Semester_effective)  | Fall, 2017 |
| A.7. [Resource impact](#Resource) | *[Faculty PT & FT](#faculty" \o "Need to hire new full-time or part-time faculty? This is where you indicate if this proposal will be affecting FLH in your department/program.)*:  | **One additional load hour every other year** |
|  | [*Library*:](#library) | **None** |
|  | [*Technology*](#technology) | **None** |
|  | [*Facilities*](#facilities): | **none** |
| A.8. [Program impact](#prog_impact) | **This would affect only the physics and physics secondary education programs.** |
| A.9. [Student impact](#student_impact) | **This will allow students to have a more through introduction to quantum mechanics within the 300 level course.** |
| A.10. The following screen tips are for information on what to do about catalog copy until the new CMS is in place; check the “Forms and Information” page for updates. [Catalog page.](#catalog)  [Where are the catalog pages](#catalog)? [Several related proposals](#catalog)? Do **not** list catalog pages here. **All** catalog copy for a proposal must be contained within a **single** file; put page breaks between sections. Make sure affected program totals are correct if adding/deleting course credits. |

B. [NEW OR REVISED COURSES](#delete_if) **DELETE THE WORDS THAT DO NOT APPLY TO YOUR PROPOSAL within specific categories, but do not delete any of the categories. DO NOT use highlight. Delete this whole page if this proposal does not include a new or revised course.**

|  | Old ([for revisions only](#Revisions)) | New |
| --- | --- | --- |
| B.1. [Course prefix and number](#cours_title)  | **PHYS 307** | **PHYS 307** |
| B.2. Cross listing number if any |  |  |
| B.3. [Course title](#title)  | **Quantum Mechanics I** | **Quantum Mechanics I** |
| B.4. [Course description](#description)  | Topics include relativistic mechanics, the failures of classical physics, the structure of the atom, and the wave description of matter, including the Schödinger Equation. Lecture | Topics include the failures of classical physics, the structure of the atom, and the wave description of matter including the Schödinger Equation, the hydrogen atom, angular momentum and spin. Lecture |
| B.5. [Prerequisite(s)](#prereqs) | **PHYS 201** | **PHYS 201** |
| B.6. [Offered](#Offered) | **Fall** **Even years**  | **Fall** **Even years**  |
| B.7. [Contact hours](#contacthours)  | **3** | **4** |
| B.8. [Credit hours](#credits) | **3** | **4** |
| B.9. [Justify differences if any](#differences) |  |
| B.10. [Grading system](#grading)  | **Letter grade**  | **Letter grade**  |
| B.11. [Instructional methods](#instr_methods) | **Lecture**  | **Lecture**  |
| B.12.[Categories](#required) | **Required for major/minor**  | **Required for major/minor**  |
| B.13. Is this an Honors course? | **NO** | **NO** |
| B.14. [General Education](#ge)N.B. Connections must include at least 50% Standard Classroom instruction. |  **NO**  | **NO****:** |
| B.15. [How will student performance be evaluated?](#performance) | **Attendance | Class participation | Exams | Presentations |Class Work | Quizzes | Projects |**  | **Attendance | Class participation | Exams | Presentations |Class Work | Quizzes | Projects |**  |
| B.16. [Redundancy statement](#competing) |  |  |
| B. 17. Other changes, if any |  |

| B.18**.** [**Course learning outcomes**](#outcomes) | [**Standard(s)**](#standards) | [**How will they be measured**](#measured)**?** |
| --- | --- | --- |
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| B.19. [**Topical outline**](#outline) |
| --- |
| 1. Introduction to the atom
	1. Elements, atoms and molecules
	2. Protons, neutrons and electrons
	3. Atomic units
	4. Kinetic theory and diffusion
	5. Brownian motion
	6. The discovery of the electron
	7. The Rutherford Experiment
2. Failures of Classical Mechanics and the Quantization of Light
	1. Blackbody Radiation
	2. The Photoelectric Effect
	3. Bragg diffraction and X ray spectra
	4. The Compton Effect
	5. Particle wave duality
3. Quantization of Atomic Energy Levels
	1. Atomic spectra
	2. Atomic stability
	3. Bohr atom
4. Matter Waves
	1. Debroglie hypothesis and its experimental verification
	2. Quantum waves
	3. Electron diffraction
5. The Schrödinger Equation in One Dimension
	1. Standing waves
	2. Particle in a Rigid Box
	3. Time Independent Schrödinger Equation
	4. Free particle
	5. Simple harmonic oscillator
	6. Tunneling
	7. Time dependent Schrödinger equation
6. The Three-Dimensional Schrödinger Equation
	1. Two dimensional square box
	2. Central force problems
	3. Quantization of angular momentum
	4. Energy levels of the hydrogen atom
7. Electron Spin
	1. Spin angular momentum
	2. Magnetic moment
	3. The Zeeman effect
	4. Fine Structure
 |
|  |

## D. Signatures

##### D.1. Approvals

* Changes that affect General Education in any way MUST be approved by ALL Deans and COGE Chair.
* Changes that directly impact more than one department/program MUST have the signatures of all relevant department chairs, program directors, and relevant dean (e.g. when creating/revising a program using courses from other departments/programs). Check UCC manual 4.2 for further guidelines on whether the signatures need to be approval or acknowledgement.
* Proposals that do not have appropriate approval signatures will not be considered.
* Type in name of person signing and their position/affiliation.
* Send electronic files of this proposal and accompanying catalog copy to curriculum@ric.edu and a printed or electronic signature copy of this form to the current Chair of UCC. Check UCC website for due dates.

| Name | Position/affiliation | [Signature](#_Signature" \o "Insert electronic signature, if available, in this column) | Date |
| --- | --- | --- | --- |
| Dr. Peter Meyer | Chair of Physical Sciences |  |  |
| Dr. Earl Simson | Dean of Arts of Sciences |  |  |
| Dr. Donald Halquist | Dean of the Feinstein School of Education and Human Development |  | Tab to add rows |

##### D.2. [Acknowledgements](#acknowledge)

| Name | Position/affiliation | [Signature](#Signature_2) | Date |
| --- | --- | --- | --- |
| Dr. Gerri August | Chair of Educational Studies |  |  |
|  |  |  |  |
|  |  |  | Tab to add rows |