*We recognize and acknowledge that McMaster University meets and learns on the traditional territories of the Mississauga and Haudenosaunee nations, and within the lands protected by the “Dish With One Spoon” wampum, an agreement amongst all allied Nations to peaceably share and care for the resources around the Great Lakes.*

**BIOCHEM 3CB3 – EMERGING DISCOVERY IN CELL BIOLOGY**

**2021 Fall Term**

**Instructor:** Ray Truant **| Email:** [truantr@mcmaster.ca](mailto:truantr@mcmaster.ca)

**Teaching Assistant:** Celeste Suart **| Email:** [suartce@mcmaster.ca](mailto:suartce@mcmaster.ca)

**Lecture:** Classes online via Zoom meetings, Monday, Tuesday, 1:30-2:20pm. Thursday 12:30 - 1:20 pm

**Disclaimer**

The information (course outline, evaluation) provided in this document supersedes all other information previously available.

**Introduction**

This course constitutes a critical study of selected literature from recent primary manuscripts on cell biology and biochemistry of selected regulatory pathways in eukaryotes. Emphasis is placed on the molecular and cellular biology of selected pathways that interact to affect phenomena in biology and disease. The course will be divided into three sections:

Section 1) Protein Nuclear Transport

Section 2) ER Stress and the Unfolded Protein Response

Section 3) The actin cytoskeleton

**LEARNING OBJECTIVES** - NA

**MATERIALS & FEES**

* Textbook: None

**VIRTUAL COURSE DELIVERY**

**To follow and participate in virtual classes it is expected that you have reliable access to the following:**

* A computer that meets performance requirements [found here](https://cto.mcmaster.ca/technology-resources-for-mcmaster-students/#tab-content-device-recommendations).
* An internet connection that is fast enough to stream video.
* Computer accessories that enable class participation, such as a microphone, speakers and webcam when needed.

If you think that you will not be able to meet these requirements, please contact [uts@mcmaster.ca](mailto:uts@mcmaster.ca) as soon as you can. Please visit the [Technology Resources for Students page](https://cto.mcmaster.ca/technology-resources-for-mcmaster-students/#tab-content-device-recommendations) for detailed requirements. If you use assistive technology or believe that our platforms might be a barrier to participating, please contact [Student Accessibility Services](https://sas.mcmaster.ca/), [sas@mcmaster.ca](mailto:sas@mcmaster.ca), for support.

**EVALUATION**

|  |  |  |
| --- | --- | --- |
| **Item** | **Due Date** | **Weighting** |
| Manuscript Presentation | Variable, see below | 30% |
| Written Paper | November 24 | 25% |
| Test I | October 5 | 15% |
| Test II | November 9 | 15% |
| Test III | December 6 | 15% |

Final Exam: **None**

**Manuscript presentation:** Students will organize into groups of 2 (9 groups total) and each group will be responsible for three 40 minute presentations to the class on a paper assigned by the instructor on the date specified. Time should be allowed for questions/discussion. Any presentation format is acceptable. This format is as would be given in a graduate course with emphasis on background, data and figures, their interpretation, controls and techniques used.

**Written Paper:** Each group will prepare and present a paper on a topic assigned by the instructor

**Tests:** Three tests will be held during regularly scheduled class periods unless otherwise indicated.

**Participation:** Participation is an important component of this course. Students are expected to read all of the papers assigned to the class, to attend all classes and to be prepared to discuss the material. Questions on the tests will largely be drawn from what has been presented/discussed in class. Attendance is essential to do well in this course.

**Tests:** Tests will be administered through Avenue to Learn. See the course Netiquette guidelines for further details.

**COURSE OVERVIEW AND ASSESSMENT**

**Reading Schedule**

|  |  |  |  |
| --- | --- | --- | --- |
| **Week** | **Monday** | **Wednesday** | **Friday** |
| 1 |  | Sept 7  First week -Truant | Sept 9  First week -Truant |
| 2 | Sept 13 Group A | Sept 14 Group A | Sept 16 Group A |
| 3 | Sept 20 Group B | Sept 21 Group B | Sept 23 Group B |
| 4 | Sept 27 Group C | Sept 28 Group C | Sept 30 Group C |
| 5 | Oct 4  Section 2 intro - | Oct 5 Quiz1 | Oct 7 Quiz1 takeup |
| 6 | Oct 11 recess | Oct 12 recess | Oct 14 recess |
| 7 | Oct 18 Group D | Oct 19 Group D | Oct 21 Group D |
| 8 | Oct 25 Group E | Oct 26 Group E | Oct 28 Group E |
| 9 | Nov 1 Group F | Nov 2 Group F | Nov 4 Group F |
| 10 | Nov 8  Section 3 intro-Truant | Nov 9 Quiz#2 | Nov 11  Quiz #2 takeup |
| 11 | Nov 15 Group G | Nov 16 Group G | Nov 18 Group G |
| 12 | Nov 22 Group H | Nov 23 Group H | Nov 24  Group H –Papers due |
| 13 | Nov 29  Group I | Nov 30 Group I | Dec 2 Group I |
| 14 | Dec 6 Quiz #3 | Dec 7  Quiz #3 takeup |  |

**Assigned Readings**

**Introduction (Truant)**

* Fornerod, M., Ohno, M., Yoshida, M. and Mattaj, I.W., 1997. CRM1 is an export receptor for leucine-rich nuclear export signals. ***Cell*, *90***(6), pp.1051-1060.

**Group A**

* Enenkel, C., Blobel, G. and Rexach, M., 1995. Identification of a yeast karyopherin heterodimer that targets import substrate to mammalian nuclear pore complexes. ***Journal of Biological* *Chemistry***, *270*(28), pp.16499-16502.
* Frey, S. and Gorlich, D., 2007. A saturated FG-repeat hydrogel can reproduce the permeability properties of nuclear pore complexes. ***Cell*, *130***(3), pp.512-523.

**Group B**

* Gorlich, D., Prehn, S., Laskey, R.A. and Hartmann, E., 1994. Isolation of a protein that is essential for the first step of nuclear protein import. ***Cell*, *79***(5), pp.767-778.
* Moore, M.S. and Blobel, G., 1993. The GTP-binding protein Ran/TC4 is required for protein import into the nucleus. ***Nature*, *365***(6447), pp.661-663.

**Group C**

* Lee, B.J., Cansizoglu, A.E., Suel, K.E., Louis, T.H., Zhang, Z. and Chook, Y.M., 2006. Rules for nuclear localization sequence recognition by karyopherinβ2. ***Cell*, *126***(3), pp.543-558.

**Group D**

* Cox, J.S., Shamu, C.E. and Walter, P., 1993. Transcriptional induction of genes encoding endoplasmic reticulum resident proteins requires a transmembrane protein kinase. ***Cell*, *73***(6), pp.1197-1206.
* Cox, J.S. and Walter, P., 1996. A novel mechanism for regulating activity of a transcription factor that controls the unfolded protein response. ***Cell*, *87***(3), pp.391-404.

**Group E**

* Sidrauski, C., Cox, J.S. and Walter, P., 1996. tRNA ligase is required for regulated mRNA splicing in the unfolded protein response. ***Cell*, *87***(3), pp.405-413.
* Sidrauski, C. and Walter, P., 1997. The transmembrane kinase Ire1p is a site-specific endonuclease that initiates mRNA splicing in the unfolded protein response. ***Cell*, *90***(6), pp.1031-1039.

**Group F**

* Katayama, T., Imaizumi, K., Sato, N., Miyoshi, K., Kudo, T., Hitomi, J., Morihara, T., Yoneda, T., Gomi, F., Mori, Y. and Nakano, Y., 1999. Presenilin-1 mutations downregulate the signalling pathway of the unfolded-protein response. ***Nature cell biology*, *1***(8), pp.479-485.

**Group G**

* Efimova, N., Yang, C., Chia, J.X., Li, N., Lengner, C.J., Neufeld, K.L. and Svitkina, T.M., 2020. Branched actin networks are assembled on microtubules by adenomatous polyposis coli for targeted membrane protrusion. ***Journal of Cell Biology*, *219***(9).
* Xu, K., Zhong, G. and Zhuang, X., 2013. Actin, spectrin, and associated proteins form a periodic cytoskeletal structure in axons. ***Science*, *339***(6118), pp.452-456.

**Group H**

* Munsie, L.N., Desmond, C.R. and Truant, R., 2012. Cofilin nuclear–cytoplasmic shuttling affects cofilin– actin rod formation during stress. ***Journal of cell science*, *125***(17), pp.3977-3988.

**Group I**

* Guo et al., 2014. Actin stress in cell reprogramming. ***PNAS*** December 9, 2014 111 (49) E5252-E526

**Suggested Readings**

These are reviews or other resources which will give context to what is being discussed in class.

**Section 1 (A-C)**

* Beck, M. and Hurt, E., 2017. The nuclear pore complex: understanding its function through structural insight. ***Nature reviews Molecular cell biology*, *18***(2), p.73.

**Section 2 (D-F)**

* Walter, P. and Ron, D., 2011. The unfolded protein response: from stress pathway to homeostatic regulation. ***Science*, *334***(6059), pp.1081-1086.

**Section 3 (G-I)**

* Pollard, T.D. and Borisy, G.G., 2003. Cellular motility driven by assembly and disassembly of actin filaments. Cell, 112(4), pp.453-465.
* Fletcher, D.A. and Mullins, R.D., 2010. Cell mechanics and the cytoskeleton. Nature, 463(7280), pp.485- 492.
* Bilmoria, P. 2013. Surprises in the skeletons of neurons: Super-resolution imaging leads to discovery of regularly spaced actin rings in axons
* Jockusch, B.M. ed., 2017. The Actin Cytoskeleton (Vol. 235). Berlin: Springer.

**Avenue2Learn**

This course uses Avenue2Learn to post the course outline, assignments, other notices and all other course related material. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructors.

**Modifications to Course**

The instructors and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

**REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK**

[McMaster Student Absence Form (MSAF):](https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/msaf-mcmaster-student-absence-form/) In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”.

**Absences and Missed Work**

If you are absent from the university for a minor medical reason, lasting fewer than 5 days, you may report your absence, once per term, without documentation, using the McMaster Student Absence Form. Absences for a longer duration or for other reasons must be reported to your Faculty/Program office, with documentation, and relief from term work may not necessarily be granted. When using the MSAF, report your absence to [course\_email@mcmaster.ca]. You must then contact Dr. Truant immediately (**within 3 working days**) by email at the addresses indicated above to learn what relief may be granted for the work you have missed, and relevant details such as revised deadlines, or time and location of a make-up exam. Please note that the MSAF may not be used for term work worth 25% or more. Please also note that normally missed coursework due to un-reported, un-excused absences will result in a mark of zero (“0”) for that work. Missed coursework (e.g. tests) due to reported/excused absences will be made up (make up test). It is the student’s responsibility to contact Dr. Truant to arrange to make up the missed work. If the student neglects to make arrangements to make up missed work after an absence, then a mark of zero for that work may result.

**ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES**

Students with disabilities who require academic accommodation must contact [Student Accessibility Services (SAS](https://sas.mcmaster.ca/)) at 905-525-9140 ext. 28652 or [sas@mcmaster.ca](mailto:sas@mcmaster.ca) to make arrangements with a Program Coordinator. For further information, consult McMaster University’s [*Academic Accommodation of Students with Disabilities*](https://secretariat.mcmaster.ca/app/uploads/Academic-Accommodations-Policy.pdf) policy.

**ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)**

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the [RISO](https://secretariat.mcmaster.ca/app/uploads/2019/02/Academic-Accommodation-for-Religious-Indigenous-and-Spiritual-Observances-Policy-on.pdf) policy. Students should submit their request to their Faculty Office ***normally within 10 working days*** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

**COURSES WITH AN ON-LINE ELEMENT**

***Some courses may*** use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

**ONLINE PROCTORING**

**Some courses may** use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

**ACADEMIC INTEGRITY**

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

**It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: “Grade of F assigned for academic dishonesty”), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the [*Academic Integrity Policy*](https://secretariat.mcmaster.ca/app/uploads/Academic-Integrity-Policy-1-1.pdf)*,* located at [https://secretariat.mcmaster.ca/university-policies-procedures- guidelines/](https://secretariat.mcmaster.ca/university-policies-procedures-%20guidelines/)

**The following illustrates only three forms of academic dishonesty:**

* plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
* improper collaboration in group work.
* copying or using unauthorized aids in tests and examinations.

**AUTHENTICITY / PLAGIARISM DETECTION**

***Some courses may*** use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster’s use of Turnitin.com please go to [www.mcmaster.ca/academicintegrity.](http://www.mcmaster.ca/academicintegrity)

**CONDUCT EXPECTATIONS**

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all our living, learning and working communities. These expectations are described in the [*Code of Student Rights & Responsibilities* (the “Code”).](https://secretariat.mcmaster.ca/app/uploads/Code-of-Student-Rights-and-Responsibilities.pdf) All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students’ access to these platforms.

**COPYRIGHT AND RECORDING**

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

**RESEARCH ETHICS** – NA

**EXTREME CIRCUMSTANCES**

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.