Physics and Astronomy Articulation Minutes 2019 May 3 2019

Okanagan College, 1000 KLO Road, Kelowna, BC Room S103B

Chair: Jennifer Kirkey Minute Taker: Robert Stutz

8:30 am Coffee and Carbohydrates were provided by Okanagan College.

#1	9:00	The meeting began by respectfully recognizing that we were gathered today on the traditional unceded territory of the Syilx Okanagan People. Phil Ashman, Kelowna Regional Dean, welcomed the group to Okanagan College. Phil outlined the public talk by Dr. Paul Scholz tonight and tour of DRAO tomorrow. Phil talked about importance of articulation and smooth transitions for students between institutions. Phil thanked everyone for being here. Round table of introductions followed. Douglas College also provided every institution with a very nice laser-carved wooden placard of their logos.
#2	9:10	Approval of the Agenda Moved by Peter Mulhern, passed unanimously.
#3	9:15 am	Approval of the Minutes. Moved by Tara Todoruk, passed unanimously without any changes. The chair showed a Star Wars crawl to commemorate last year's May the Fourth day. Minutes can be accessed at the BCCAT web page http://www.bccat.ca/articulation/arts/phys-astr The plan is to use a Moodle site hosted by KPU for next year.
#4	9:30 am	BCCAT update began by the chair as Fiona McQuarrie, BCCATs special project coordinator was late due to travel challenges. BCCAT turns 30 this year. Committee members were directed to visit http://www.bccat.ca/companion for information about how Articulation Committees work and the Terms of Reference under which the committees operate. In particular be aware of the standards of conduct for meetings.

		Fiona arrived and the BCCAT Spring update was handed out. Fiona directed us to the second page of the update for information on Transfer Innovations project. BCCAT provides Transfer Innovations funding to support work by articulation committees on improving student transfers. This funding is suspended for the next fiscal year. A sub-committee was set up to review the mandate, projects, and scope of the funding and found that projects seem to be making marginal contributions to student transfers. Our transfer system is already well developed so finding new pathways is difficult – thus the decision to suspend funding for now. The project will return in 2020-2021, coming back with a renewed mandate. Other items: Education Planner BC – a website that used to be run by BCCAT is now spun-off as its own entity run by a not-for-profit society. The website should remain the same visually, but BCCAT is no longer running it. BCCAT also put in a statement of respectful behaviour for BCCAT articulation meetings (not in response to any particular event). The whole statement can be found on the BCCAT articulation webpage. Normally the hosting institution has a behaviour code that should cover everything, and articulation will use the local code when appropriate. BCCAT has an ongoing research project looking at dual-credit programs in academic subjects. They've commissioned a study with an external firm to look at dual credit in academic courses. This has been challenging as there are a lot fewer academic courses than trades course that are available for dual credit. The study is also investigating whether if someone does dual-credit, are they more likely to go to that institution? And do dual-credit students do better? Hope to complete the study by end of year. Fiona also mentioned the 30-year anniversary for BCCAT. Math and Stats is oldest articulation committee. BCCAT was initially started by faculty members and worked with informal agreements.

		Next Chairs' meeting is Nov 1st 2019. Hoping for anniversary event Oct. 31st 2019. A "Friends of BCCAT" campaign is running on social media and the website – showcasing how the transfer system has benefitted students and faculty.
#5	10:00 am	Reviewed the courses in the system that are still waiting transfer via the attached TCES report. Committee members with courses on the list were directed to make a point of talking with the relevant institution today or as soon as possible. Dennis Lightfoot from North Island College remarked that their pending PHYS170 articulation request should be sent to Engineering department as it's an Engineering Mechanics course.
#6	10:15 am	SLP = BCCAT System Liaison. Dr Sylvia Desjradins from UBC-O has agreed to be our temporary SLP. This committee is currently without a permanent SLP. It must be a dean or associate dean who has physics as part of their faculty. No other names were offered at the time of the meeting. The purpose of SLP is to provide the other "type" of information (other angle) from the administration side. Sylvie remarked that she has not been to the Deans' meeting about articulation, so can't comment on it, but will attend the upcoming Fall meeting and update us after that.
#7	10:30	Open Textbook update from BCcampus. Provincial government just awarded them $3.6 million dollars for projects such as" ZED Cred" (Zero for Zero and ED for Education) and an open online homework system. Details: Zed-Cred: three institutions where you can do a full credential where there are no paid textbooks – all open-source within that credential. ("Z" for ZERO cost). KPU is a leader in this. Kelly Cheung wondered if it's actually zero cost, or whether there were small associated costs? Jennifer clarified that anything under

		$20-30 is considered no cost. Sometimes lab manuals cost a little bit and occasionally the cost of printing is charged to students. Jennifer Kirkey mentioned how it is difficult to get faculty time release, but getting student funding is easier. Work is being put into creating question banks and test banks. UBC is hiring students in Engineering to code and make up questions – but there is more money available from BCcampus. BCCampus finds that having homework question bank is why people still use traditional publishers. UBC – Tom Mattison mentioned that Calculus at UBC is all open source texts and using a WebWorks question bank that was created at UBC. UBC would share their question bank if asked, and all questions are OpenSource. UVIC - Mark Laidlaw adds that at UVIC they have also made in-house questions for their Calculus-based Physics course. He would be happy to discuss how to make such questions. Jennifer Kirkey confirmed that those working on such Engineering WebWorks questions are using Hibbeler text in UBC PHYS170. VIU - Brian Dick mentioned that BCCampus may have funding for a common core open-source materials, including a common core open-source text in Engineering soon – which would be roughly similar to the Hibbeler text. James Brewer from BCIT asks: could we get open-source materials from elsewhere? Are we reinventing the wheel? Jennifer: BCcampus spent money in curating other books, instead of starting from scratch. Jennifer Kirkey brought some OpenStax textbooks that you can look at. Jennifer mentioned that 50% of those in the US using open-source texts are using the OpenStax algebra-based Physics text. OpenStax says it's about 1 million dollars to create a text. Reviewers can be paid $250 for reviewing a book at BCcampus

		Open Textbook site. https://open.bccampus.ca/use-open-textbooks/review-an-open-textbook/ Jake Bobowski: how open is open? Can it be fully modified? Jennifer confirmed that yes, it if fully editable, from source. You only need to attribute where it comes from: OpenStax. OpenStax is in now in Pressbooks thanks to BCCampus and Jennifer Kirkey for easier editing and equations are written in LaTeX. Do whatever you want with it. Peter Mulhern inquired as to the cost. Jennifer: Direct from OpenStax it is about $40 each hardcover, through Amazon.ca $60-70 each. Your bookstore can contact Douglas College if they need help with ordering. Jaclyn Semple from Yukon College mentioned problems ordering print copies or getting it shipped. OpenCampus did deliver whereas Amazon wouldn't do it. Barbara Frisken: do any of these changes propagate back to original version? Is original version still improving? Jennifer: yes! Continual improvements are being made, and there is an editorial board. Selkirk College - Elroy Switlishloff – asked if there an impact on publishers Jennifer replied there was some, but not too much… they're using online systems to try to keep people. Jennifer also mentioned that the cost of textbooks may be starting to decrease from this increased competition with Open Source texts. Kelly Cheung: how finalized are the texts? Are there missing topics? Will more depth be introduced – do I need to do this myself? Jennifer: depends on which text. Contact the editorial board on website to give them feedback. Langara - Erfan Rezaie - asked if we can get a list on a website of who is using which version of the text? Which pieces etc.? Jennifer: this doesn't currently exist, but they may post adapted

		versions on the website in the future. Jennifer: please tell BCcampus if you've adopted an open-source textbook. James Brewer: We use Giancoli textbook, but provide free alternatives to textbooks for each section – we make our own worksheets & solutions as an alternative – ie. you can still have a textbook but provide optional (free or cheaper) alternatives. Jennifer mentioned that BCcampus is willing to fund you to make ancillary resources such as slides for the textbook, textbook sprints, etc. Students can do this work. Jennifer: OpenStax Astronomy is pretty good but still has problems – needs a Canadian version, American version isn't great, but we are working on it. There were questions about the equations in Pressbooks. They are LaTex based, but PressBooks is based on WordPress, not LaTex. Jennifer walked us through the PressBooks website to show how to edit, including equations, and export a new version of the OpenStax text.
	10:45	Break
#8	11:00	Elmas Ataby, Science Coordinator for the Ministry of Education presentation via conference call. PowerPoint slide deck was shown and Elmas talked through it. *curriculum finalization for grades 11 and 12; *course structure information for Science * initial notions on the curriculum review and revision cycle. Overview: the new curriculum is less prescriptive compared to old IRPs. More focus on inquiry and conceptual learning. Opportunities for students to ask questions and make informed decisions. Implementing a "Know-do-understand" model. Graduation requirements: see slides. There will still be letter grades and percentages. Numeracy 10 and Literacy 10 will be the only "provincial exam" assessments. <u>Q&A after the presentation:</u>

		Tara Todoruk: what about students switching from Gr. 11 to Gr. 12 when curriculum changes? Will they miss out certain topics? Elmas: our Ministry has no mandate over content delivery, that's up to the teachers themselves. Teacher should see what students are missing in the changeover, and fill in the gaps there. Mark Laidlaw: what about going back to provincial exams as a benchmark, since we don't have "quality assurance" that HS teachers are covering the learning outcomes. Elmast: Numeracy 10 and Literacy 10 will be the only province-wide exams. Jennifer Kirkey: are we going to get grades on a transcript? Elmas: yes. Tom Madison: at first there was a big emphasis on teachers picking and choosing what topics they want to cover. This now seems less like that – with an expectation that the entire list of topics will be covered – is that right? Elmas: yes, modular structures were discussed at first, but we've moved away from it for Science curriculum. The content standards ALL have to be covered. No more optional modules. Tom Mattison: is the same true for Math? Elmas: yes. James Brewer: how do we know grades are consistent from different HS? Elmas: we can't guarantee that consistency. Brian Dick: what is the required content? Elmas: what is mandated are the content pieces that need to be covered –but we have no way to guarantee or make sure that this actually happens in high-school classes. Brian Dick: teachers may have various competencies – does the ministry have a plan on engaging the teachers (especially in rural areas) in how to implement this new content? Elmas: I will need to follow-up on this and get back to you. Barbara Frisken: getting typical final exams from high-schools would help give us some information on what's actually covered. Is that possible? Jennifer: The Ministry used to have provincial test banks - is the ministry planning on anything like that? Elmas: we are working on support pieces such as instructional samples and assessment – to be posted on website. Michael Poon: we've invited KPU faculty to go into local high-schools to see what they're teaching. The result is that they're

		doing it pretty well! George Jones from UNBC has done something similar. < **End of Conference Call >** <u>Further discussion about Ministry presentation:</u> After a brief discussion about the need for the Ministry to hire someone to make better PowerPoint slides that follow the "Rule Of Six", more substantive discussion occurred. George Jones: Previous IRP was much more detailed, new topics are just a list. We're concerned. Michael Poon: high-school teachers are looking for us to put forward what we expect – we could put something together and they would follow it. Fiona McQuarrie: attended the Economics Articulation meeting recently, and they're also concerned. Committees can express concerns through the SLP to the Ministry. Tara Todoruk: if teachers aren't physicists, the topics list is not detailed enough to know what to cover. Also, this may not be the final document we can expect last-minute changes. Brian Dick: curriculum changes are Lower-Mainland centered – where students can move around to different courses and instructors as needed. This is a problem for rural school districts. These questions were asked 4 years ago and there has been no progress, we should be 'concerned about the authenticity of the engagement' of the ministry. Barbara Frisken: do we know how many teachers don't' have Physics backgrounds? Would be useful for reporting concerns. Jennifer Kirkey suggested creating an articulation sub-committee to create a "post-secondary expectations for high-school students" document. ACTION Mark Laidlaw: we know what a first-year [post-secondary] Physics course looks like, so we have a common understanding of what we think it means to have taken Physics 12. Could we put together a document listing the topics we think are important, including example problems? Not intended to be a curriculum replacement,

		but as an example of the content and depth we expect. We could then provide this to the teachers. George Jones: High-schools wouldn't mind having such a document, but the Ministry will care. Michael Poon: could we do an entrance exam for the topics we want covered? There was support for creating a learning outcome document. The question was could we make a diagnostic entrance exam for domestic students? Langara has one for international students already. Tom Mattison: at UBC, Chemistry created a high-school equivalent course – and a pre-first-year exam to stream students into this course. They write it first week. Mark Laidlaw: at UVIC, diagnostic exam exists for low-mark entrance students, some students then streamed into a remedial Calculus course. But it is a logistical nightmare. Tom Mattison: keep in mind for writing this document that we re-teach these topics anyway. The thing that would help most at high-school is to get the teachers to give problems where two equations from a formula sheet need to be used – more extension of learning problems. Inflexible thinking is the real issue with incoming students. George Jones: teachers say they don't have enough time for this, but said they would try to do more quantitative problems. Peter Mulhern: we don't care about Physics 12 competency, we care about Pre-Calc 12. **Action: Subcommittee created to work on "post-secondary Physics expectations" document:** Mark Laidlaw, Barbara Frisken, Lauren Moffatt, Regan Sibbald.
		Takashi Sato: on a related note, the BCAPT's current executive chose not to come to Okanagan for this year's meeting – they are Lower-Mainland centric. If you're interested in joining the BCAPT you can pay Takashi the $15 dollars for membership, or you can do it online. If such a document were created maybe BCAPT would take it into consideration.

#9	11:30	Report highlights. Maximum of 5 minutes per institution. Reports can be found at the end of this document.
#10	12:00	A very tasty lunch was provided by Okanagan College.
#11	1:00	Reports continued.
#12	2:00 pm	**Discussion on relevant issues** Discussion #1 Do other institutions require students pass the lab component to pass the course? How about passing major tests (midterms, final)? Most institutions require students to pass the lab component in order to pass the lecture component of a course, excepting UBC, KPU and Douglas. At KPU and Douglas, they need to do all the experiments but are not required to pass. At North Island College students have to pass the lab and have to pass the average of the tests (>50% on average of exams). Approximately five institutions require a passing grade on the final exam in order to pass the course. Other institutions have various (30%-40%) minimum final exam requirements. Also most institutions have the lab count for ~20% (max 30%) of overall course grade. if an institution wants to change percentage of weighting of labs or final exam, does this matter for articulation? Is there a cut off that triggers articulation? Consensus was that the change would probably require documentation, but would likely still articulate.
		Discussion Item #2 Do other institutions use FCI (Force Concept Inventory) to gauge incoming students' physics knowledge and how much physics knowledge they have gained through the course? If so, are questions very similar to those on the FCI taught in class (theoretically lead to higher gains) or are only questions somewhat similar to those on the FCI taught in class so students have to think more during the FCI (and possibly have lower gains)?

		Four institutions use the Force Concept Inventory: Douglas College, UBC-Vancouver, UBC-Okanagan, and SFU. Barbara Frisken remarked that it is useful for reviewing pedagogical shifts. Sylvie Desjardins (SLP): what about a Force Concept Inventory we could create for Grade 12 and then give that tool to the high-schools
		Discussion Item #3 There is increasing pressure to include learning outcomes relevant to Indigenous People in courses. Part of this is due to the Truth and Reconciliation Commission Calls to Action. http://trc.ca/assets/pdf/Calls_to_Action_English2.pdf BCcampus Indigenization Project has some resources – Jennifer to send these around. ACTION Link: https://bccampus.ca/category/indigenization/ They are already be in PressBooks. There are issues around how to do this respectfully. Sylvie Desjardins: the challenge in Sciences is that we try to look for content to include, whereas it may be the ways of learning that are different and that we can try – students may benefit if we change the way we teach. Tara Todoruk: some resources should be coming out of the Grade 11 & 12 curriculum changes that may also be useful for post-secondary. Jennifer will spearhead Indigenization work and will share resources. Jaclyn Semple: any other institutions that require graduating students take a first-nations course? Response: not really. Sylvie Desjardins: for new BSc. Degree at UBC-Okanagan some course with Indigenization may be required in 2022. At Yukon all staff and faculty do a one-day course, and all students need to take a full course. Action: Agenda item for next year: coming back to share resources on Indigenization.
		Discussion Item #4 Is it time for a general review of articulation? People change courses and never update the articulation documentation. I know it sounds like a project, but there are a lot of inconsistencies in the system and I think this must make it very difficult for students. Could BCCAT hire somebody who would systematically review all physics transfer agreements and sort out the problems?

		Barbara Frisken: SFU transfer agreements seem messy. Should we do a general review of articulation? Specifically courses that transfer to SFU. Do people do their own regular reviews? BCIT has done, see report. James Brewer: can't we all just articulate to (four) single common first-year courses for algebra-based or calculus-based? Tom Mattison: mapping to UBC first-year courses will be challenging. Tara Todoruk: department heads review articulation agreements on a regular basis. We don't offer a course unless it transfers to two large universities. Jennifer Kirkey the chair suggested an action item. May we all pledge to do a general review of where our courses transfer over this next year – for both sending and receiving? New Curriculum for PHYS11 and PHYS12 James Brewer: since the Grade 11 & 12 courses are changing, do we still accept them? Mark Laidlaw: was on committee looking in detail at all of the new curriculum; the conclusion was that the new Physics 11 & 12 were pretty close to old ones, and even if they weren't, what could we do? So yes, just roll over all of the existing Physics 11 & 12 pre-reqs. All institutions confirmed that new Physics 11 & 12 would be accepted.
#12	3:15 pm	Location for 2020 meeting. KPU Kwantlen Polytechnique in Richmond on Friday May 1,2020. Engineering articulation is on Thursday April 30 2020 at BCIT. Meeting to start at 10:00 am, similar to Engineering so that people have more time to fly in.
#13	3:30	Adjournment. Motion to adjourn passed unanimously.
#14	3:45	Tour of the facilities

Friday night dinner: Mission Tap House 3110 Lakeshore Rd, Kelowna, BC
Friday night lecture: Fast Radio Bursts and CHIME. Our local hosts, Ryan Ransom, organized a special lecture on Friday, May 3, 2019,
7:30pm Okanagan College – Kelowna Room H115. Dr. Paul Scholz from the Dominion Radio Astrophysical Observatory (DRAO).
Saturday May 4 (May the Fourth Be With You): Tour of Dominion Radio Astrophysical Observatory (DRAO) starting about 230 pm. Ryan Ransom

from Okanagan College and colleagues will be the guides, and there was a couple of mini-presentations from staff astronomers and engineers. RRansom@okanagan.bc.ca

generated: April 25, 2019

BCCAT BRITISH COLUMBIA COUNCIL ON ADMISSIONS & TRANSFER

Status: Expiring

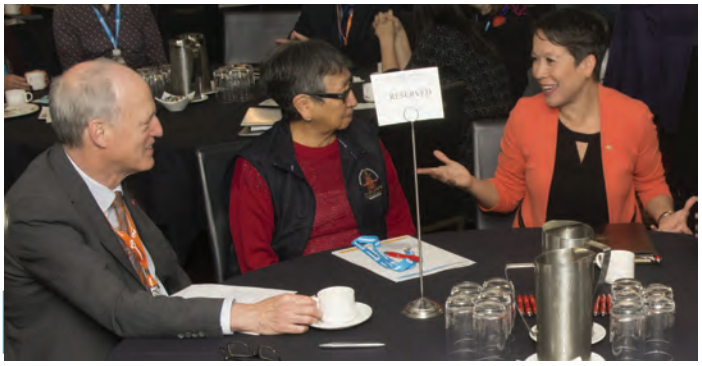
Physics & Astronomy

Pending Articulation Requests (TCS)

Course	Pending	Submitted	Expires
CAPU ASTR 142 (3)	24: ALEX, AU, CAMO, CMTN, COT	2018-12-04 9:46	2019-12-04
CAPU ASTR 300 (3)	5: AU, KPU, LCV, TRU, TRU-OL	2018-12-04 9:09	2019-12-04
CCC PHYS 100 (3)	4: CAPU, FDU, TWU, UFV	2018-05-22 10:17	2019-05-22
COLU PHYS 100 (4)	9: CAPU, LANG, SFU, TRU, TRU-OL, UBCO, UBCV, UVIC, VIU	2018-11-30 9:57	2019-11-30
COQU PHYS 101 (3)	7: ALEX, ASM, AU, CNC, CCC, FIC, CMTN	2018-06-11 13:22	2019-06-11
COQU PHYS 102 (3)	8: ALEX, ASM, AU, CNC, CCC, FIC, CMTN, TWU	2018-06-11 13:23	2019-06-11
KPU ASTR 1100 (4)	1: OC	2018-07-16 15:05	2019-07-16
NIC PHY 170 (3)	5: UVIC, SFU, TRU, UBCO, UBCV	2019-04-05 11:29	2020-04-05
NIC PHY 215 (3)	29: ALEX, ASM, AU, CAMO, CAPU, CMTN, CNC, COTR, COQU, CCC, EC, FDU, FIC, KPU, LANG, LCV, NLC, NVIT, OC, SFU, TRU, TRU-OL, UBCO, UBCV, UFV, UNBC, UVIC, VIU, YVU	2019-04-08 11:37	2020-04-08
NIC PHY 216 (3)	28: ALEX, ASM, AU, CAMO, CAPU, CMTN, CNC, COTR, COQU, CCC, EC, FDU, FIC, LANG, LCV, NLC, NVIT, OC, SFU, TRU, TRU-OL, UBCO, UBCV, UFV, UNBC, UVIC, VIU, YVU	2019-04-04 16:23	2020-04-04
OC PHYS 111 (3)	22: ALEX, AU, CAMO, CAPU, CMTN, CNC, COTR, DOUG, KPU, LANG, NLC, NVIT, SFU, TWU, TRU, TRU-OL, UBCO, UFV, UNBC, UVIC, VIU, VCC	2019-04-18 9:12	2020-04-18

30 years | BCCAT
expanding pathways for BC students

SPRING UPDATE 2019



Mr. Jim Hamilton, BCCAT Council Co-Chair, and Elder Margaret George chat with Hon. Melanie Mark at the JAM

ARTICULATION NEWS

New Downtown Venue for the 2018 Joint Annual Meeting (JAM)!

Last year's JAM was held at the Pinnacle Harbourfront Hotel in Vancouver and was the best attended ever, with over 160 attendees. The keynote speaker was Dr. Joel Heng-Hartse from SFU whose subject was "*Beyond ESL. Support for Both Multilingual and International Students in BC Higher Education*." We were also delighted to welcome Hon. Melanie Mark, Minister of Advanced Education, Skills and Training. Details of presentations can be found on the BCCAT website at bccat.ca/articulation/jam

2018 BCCAT Transfer Awards

The 2018 BCCAT Transfer Awards were presented at the JAM to the following deserving recipients:

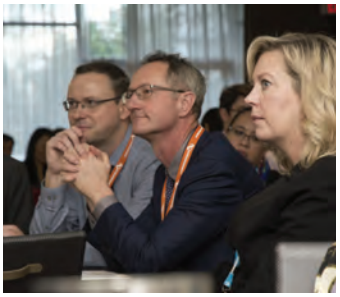
- **Dezene Huber** for the Transfer & Articulation Community Leadership Award;
- **Adrian Lipsett** also for the Transfer & Articulation Leadership Award;
- **Rick Chester and Norm Shaw** (Joint Award) for the Leadership category.

Further details can be found on the Awards section of the website at: bccat.ca/system/awards

HOLD THE DATE!

Celebrations Planned for JAM 2019

In celebration of BCCAT's 30th anniversary, special events will be scheduled for this year's JAM, which will be held at the Pinnacle Harbourfront Hotel in Vancouver on Friday, November 1, 2019. Watch for various announcements and information on the BCCAT website over the summer months!



BCCAT's Mike Winsemann and Rob Fleming, with President of Douglas College, Kathy Denton, look on during presentations at the 2018 JAM

New BCCAT Appointment

In October of 2018, Mike Winsemann was appointed to the new role of Director, Transfer & Technology, following Meg Stainsby's return to Douglas College. Mike will oversee all transfer-related issues and report to the BCCAT Transfer and Articulation Committee.

Technology Update

Ground-breaking work is currently under way with UBC on piloting the capacity of BCCAT's new version of the Transfer Credit System (TCS) to house agreements established with institutions outside of the BC Transfer System and the province. This data will then be available to other institutions.

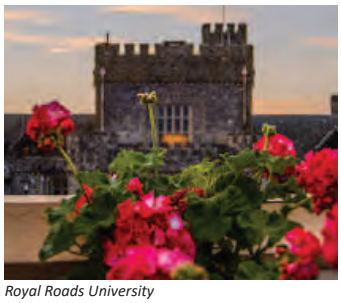
Secondary to Post-Secondary Transitions

BCCAT staff attended the BC Graduation Program Forum held last fall which was hosted by the Ministry of Education, the BC Registrars Association (BCRA) and the Senior Academic Administrators Forum (SAAF). The forum was well attended by representatives from post-secondary institutions and school districts.

2019 Articulation Season

Those committees that have generated Flexible Pre-Majors (FPMs) have been asked to review FPM functionality within the post-secondary system and to make recommendations on the future of FPMs.

Articulation Committees are also being asked to review the currency of their courses/programs on the BC Transfer Guide and to ensure that their ICPs have the most current information.



Royal Roads University

TRANSFER INNOVATIONS (TI) PROJECTS

Tourism/Hospitality Common Core: This project aligns core learning outcomes with the current requirements of industry and employers. The project is complete and will be posted on the BCCAT Tourism webpage.

Modern Languages Learning Outcomes: A survey is currently being conducted in five target languages to identify core competencies in each. The project is due for completion in December, 2019.

ABE Steering Committee Learning Outcomes: this project compares and realigns learning outcomes with those of the K-12 new curriculum.

ABE Adult Literacy Fundamentals Learning Outcomes: this project builds on the work done by the ABE Steering Committee to further streamline specific objectives and skills to guide ALF teaching.

Note: BCCAT will be reviewing the transfer innovations funding program over the next year and providing recommendations to Council in 2020. In the meantime, TI funding will be on hiatus. Currently funded transfer innovations projects and proposals under way will be unaffected.

NEW PUBLICATIONS

International Credit Practices: The report, conducted by Joanne Duklas, examines the policies and practices of processing international credit transfer requests in post-secondary institutions, primarily in BC, and provides recommendations for collaboration and sharing of best practices. The full report is available HERE and a 4-page executive summary HERE.

Issues and Challenges in Interdisciplinary Course and Program Transfer in BC This report discusses interdisciplinarity and overviews trends in such courses and programs in BC. The report can be accessed HERE.

Understanding AP Grading in BC: This report on practices of grading AP courses in BC and the post-secondary performance of students who participated in APs, can be found HERE. A 4-page executive summary is also available HERE.

ONGOING PROJECTS OF INTEREST

Survey of Mobile Students: With the assistance of BC Stats, we are surveying 30,000 students who have changed institutions to better understand their motivations and key considerations when moving, and their experience with credit transfer. Participating institutions will receive reports on students moving to and from their campuses. The survey is planned for early 2019.

Transfer Student Profile and Performance: This research will build on BCCAT's long history of documenting the successful transition of transfer students along some of the province's key learning pathways. The project is onging.

Credits to Graduation: Six BC post-secondary institutions have provided data on transfer students and direct-entry secondary students who graduated with a bachelor's degree in 2015/16. The goal of the study is to compare the total number of credits obtained by direct entry and transfer students on their way to a bachelor's degree. The project is scheduled for completion by Fall 2019.

English Language Proficiency: This project examines BC post-secondary institutions' English-language proficiency standards for admission, other than BC Grade 12 or its equivalent. Fiona McQuarrie, BCCAT Special Projects Co-ordinator, is examining standards for institutional admission and for admission to academic undergraduate courses, in addition to conducting an extensive literature review.

The Indigenous Educational Pathways: This project, led by Stephanie McKeown from UBC, and carried out through the BCCAT initiative on Contemporary Issues on Student Mobility, has been carried out in two stages. The first phase analyzed existing practices and post-secondary educators' perspectives.

The second phase of the project is currently under way and focusses on indigenous persistence from the student perspective. Focus groups are under way and the report is expected to be complete by the fall of 2019.

UBC Researcher, Stephanie McKeown, Chief Institutional Research Officer, talks about the Indigenous Education Pathways Project at the JAM, 2018.

WEBSITES

BCCAT Website: BCCAT's communications team is in the process of improving the functionality and visual elements of the site. Work is expected to be complete by the fall of 2019.

BC Transfer Guide Website: The Guide is undergoing an operational review this year, with contractor Plaid Consulting carrying out surveys and focus groups with various types of users to provide feedback and recommendations for improvements to the site. Recommended hanges and functionality is expected to be implemented in the coming year.

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Physics and Astronomy Articulation Representatives and Reports

Attendance confirmed	**Dinner**	**Name**	**Institution**	Email
Y	N	Kelly Cheung	Alexander College	Kellycheung5@gmail.com
Y	Y	James Brewer	BCIT BC Institute of Technology	James_Brewer@bcit.ca
N	N	Chris Avis	Camosun College	avisc@camosun.ca
Y	Y	Lauren Moffatt	Capilano University	laurenmoffatt@capilanou.ca
Y	Y	Bruno Tomberli	Capilano University	brunotomberli@capilanou.ca
Y		Regan Sibbald	Coast Mountain College	rsibbald@coastmountaincollege.ca
Y	Y	Barbara Rudecki	College of New Caledonia	rudecki@cnc.bc.ca
Y	Y	Trevor Beugeling	College of the Rockies	tbeugeling@cotr.bc.ca
Y	N	Tara Todoruk	Columbia College	ttodoruk@columbiacollege.bc.ca
Y		Janusz Chrzanowski	Coquitlam College	janusz@coquitlamcollege.com
Y		Hamid Maghzian	Corpus Christi College	hmaghzian@corpuschristi.ca
N		Alain Prat	Corpus Christi College	aprat@corpuschristi.ca
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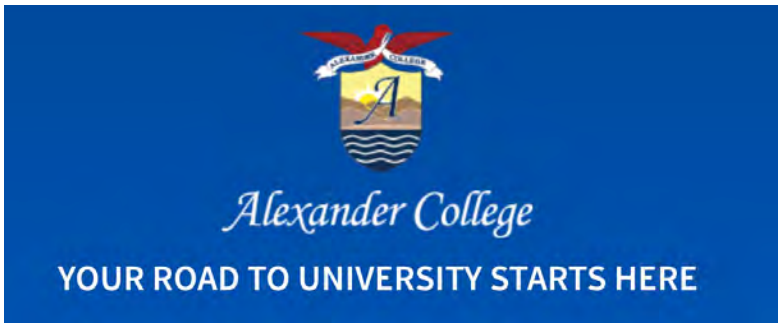
Alexander College

Kelly Cheung	Alexander College	Kellycheung5@gmail.com

Information added at the meeting

- Enrolment growing to 2500, now at capacity. Mostly international students. Physics and Engineering courses enrolment remains same.
- Hired a new faculty member.
- International student challenge: diversity of backgrounds, trying to deal with getting get the right transfers
- Attrition is about 25%.



Alexander College Physics Articulation Report: May 2019

Alexander College is a small private college that focuses primarily on foreign students who cannot get into the regular Provincial universities due to a lack of language and cultural skills. To maintain diversity, no one nationality can represent more than 50% of our student body. We offer about 100 different courses on two campuses, one in Burnaby near Metrotown and the other in Downtown Vancouver opposite SFU Harbour Centre. We have continued to experience growth in student numbers setting institutional records for Spring 2018 (2184), Fall 2018 (2504), and Winter 2019 (2585).

Our general aim is to offer students a palette of first- and second-year courses along with intensive language training and small classes, where a large amount of personal attention is possible. The courses are designed to be at the academic standards of the corresponding introductory courses at SFU, UBC and UVic and, thus, to provide

transferable credits to students who wish to gain entry to those institutions. We presently offer two-year “Associate” programs in Arts, Science, and Business, all of which include laboratory science requirements.

All Physics courses are offered at the Downtown campus limited to a class size of 20 students. Students are given the opportunity to work with concepts as they are being presented through active learning techniques and laboratory exercises. Typically, 50% of the students registered in physics courses received A or B grades.

Physics courses presently approved are:

Physics 100: Introduction to Physics (73 students over last 3 terms)

A one-semester preparatory course for students lacking physics background at the BC 12 level.

(Text: Knight, Jones, and Field, College Physics)

Physics 101-102: Physics for the Life Sciences I and II

Two sequential one-semester algebra-based introductory physics courses for students concentrating in Biology and Chemistry.

(Text: Giancoli, Physics: Principles with Applications)

Note: Has not been offered since 2011.

Physics 141-142: Engineering Physics I and II

I: Mechanics and Modern Physics (15 students over the last 3 terms)

II: Electricity and Magnetism, Optics (9 students over the last 3 terms)

Two sequential one-semester calculus-based introductory physics courses designed for science and engineering students.

(Text: Knight, Physics for Scientists and Engineers)

Physics 151-152-153: Our 3-course Engineering sequence

151: Mechanics for Engineers (8 students over the last 3 terms)

(Text: Hibbeler, Engineering Mechanics: Static and Dynamics)

152: Oscillations and Waves, Fluids, Heat, and Thermodynamics (12 students over the last 3 terms)

153: Electricity and Magnetism, Circuits, and Radiation (8 students over the last 3 terms)

(Text: Knight, Physics for Scientists and Engineers)

Physics 191: Introduction to Astronomy (not offered over the last 3 terms; will be offered next term)

(Text: Backman, ASTRO)

BCIT British Columbia Institute of Technology

James Brewer	BCIT	James_Brewer@bcit.ca

Information added at the meeting

- 3 new hires – 1 retirement and 1 moved to Associate Dean, and some release time.
- Wanted institutions to look through Table 2 [in BCIT report] and see if the transfers make sense.
- Physics numbers remain around the same.

Articulation Report, May 2019

The BCIT Physics Department has 11 full time faculty members, 3 technicians, and teaches around 1000 students in 17 different technologies.
This past year we have had one new hiring and, as of writing, are hiring again.
We are now teaching two astronomy courses as electives, one aimed at the non-engineering students, and a second aimed at students in the final year of their engineering degree.

I recently updated our internal transfer guide, which is shown below. I would appreciate it if readers would let me know of any errors or missing information in regard to their institutes.
James Brewer (jbrewer@bcit.ca)

BCIT Physics, Course Credit Transfer Guide

- For BCIT programs with a Physics 11 or Physics 12 prerequisite, an equal grade in any single post-secondary "general" physics course will be considered as equivalent. A Physics 12/C is considered equivalent to Physics 11/C+. Recency requirement as in Table 1, Footnote 1.
- Only transfer credits for the current term will be considered.
- Find your BCIT physics course in Table 1, if in section B look in Table 2 for BC equivalents, if in section C, look in Table 3 for BC equivalents. Courses that are not listed in this guide will be considered on an individual basis.

- Comments/questions? Please contact James Brewer (jbrewer@bcit.ca).

Table 1: BCIT Physics Courses.

A: Credit granted only with instructor consent		
Technology	Courses	
Biomedical Engineering	1178	
Diagnostic Medical Sonography	1073, 2073, 3073	
Electroneurophysiology	1280, 2280	
Medical Radiography	1276, 2276	
Nuclear Medicine	1274, 2274, 3274, 4274	
Radiation Therapy	5103, 6104	
Technology Entry	0311[2], 0312	
B: Credit granted with a "General" post-secondary (PS) course (see Table 2)[1]		
Technology	Term 1	Term 2
Architectural and Building Engineering	1140	2148[3]
Chemical and Environmental Technology	1181	2181
Electrical and Computer Engineering	1143	2143
Geomatics	1151	2151
Mechanical Engineering	N/A	2149
Mining and Mineral Exploration	1147	2147
Occupational Health and Safety	1288	2288
Mechatronics and Robotics	1164	2164
C: Credit granted with a calculus-based post-secondary (PS) course (see Table 3)[1]		
Technology	Term 1	Term 2
Civil Engineering	1192	2192
D: Credit granted with Grade 12 physics or equivalent (C+/65% minimum)[1]		
Food Technology	1145, 2145[4]	

Table 1 Footnotes:

(1) Recency requirement: Course(s) taken within last 5 years (exceptions will be considered).
(2) An exemption will be considered for students who have taken PHYS 0309.
(3) PHYS 2148 has insufficient course credits to be used in place of other Term 2 courses.
(4) Post-secondary courses must have sufficient overlap for an exemption to be granted.

Table 2: BC Equivalents for Courses in Table 1, Section B.

Institute	Term 1 Equivalent General PS Course	Term 2 Equivalent General PS Course	Minimum Grade
BCIT	1301, Table 1: Term 1 Courses in B&C	2301, Table 1: Term 2 Courses in B&C, except 2148	P/50%
Alexander College	141	142	C+/65%
Camosun College	104,114,140	105, 115, (140&141)	C+/65%
Capilano University	110, 114	111, 115	C+/65%
College of New Caledonia	101, 105	102, 106	C+/65%
College of the Rockies	103	104	C+/65%
Columbia College	110	120	C+/65%
Coquitlam College	101	102	C+/65%
Douglas College	1107, 1110	1207, 1210	C+/65%
Kwantlen P. University	1101, 1120, 1170	1102, 1220	C+/65%
Langara College	1101, 1125, 1219	1225	C+/65%
North Island College	100, 120	101, 121	C+/65%
Northern Lights College	103	104	C+/65%
NW Comm. College	101, 121	102, 122	C+/65%
Okanagan College	111, 112	121, 122	C+/65%
Selkirk College	102, 104	103, 105	C+/65%
SFU (before 2016)	(101&130), (120&131), 140	(102&130), (121&131), 141	C+/65%
SFU (2016 onward)	(101&132), (120&132), 140	(102&133), (121&133), 141	C+/65%
Thompson Rivers Uni.	1100, 1150	1200, 1250	C+/65%
TRU: Open Learning	(1103&1105)	(1203&1205)	C+/65%
Trinity Western Uni.	111	112	C+/65%
UBC, Vancouver	(107&109), (117&119), (170&119)	(108&109), (118&119), (158&159)	C+/65%
UBC, Okanagan	111, 112	122	C+/65%
Uni. of Fraser Valley	101, 111	105, 112	C+/65%
Uni. of Northern BC	100, 110	101, 111	C+/65%
Uni. of Victoria	102[1],102a, 110, 120	102[1],102b	C+/65%
Van. Comm. College	1100	1200	C+/65%
Van. Island University	111, 121	112, 122	C+/65%
Yukon College	101	102	C+/65%

Table 2 Notes:

- Students must apply for course credit and each application is subject to Institute approval.
- When both a letter grade and a % grade are given, the more favourable grade will be considered.
- Notation: (x&y) means courses x and y are both required, while x, y means either course x or course y is required.

- Grade 11/12 physics is insufficient for courses requiring a “general” post-secondary course.

Table 2 Footnotes:

(1) As of 2018, this course was split into 102a and 102b.
(2)

Table 3: BC Equivalents for Courses in Table 1, Section C.

Institute	PHYS 1192: Equivalent Calculus PS Course	PHYS 2192: Equivalent Calculus PS Course	Minimum Grade
Capilano University[1]	114	(115&116)	C+/65%
Douglas College	1110	(1110&1210)	C+/65%
Kwantlen P. University	1120	See Footnote 2	C+/65%
Langara College	1125	(1125&1225)	C+/65%
North Island College	120	(120&121)	C+/65%
Simon Fraser University	(120&Lab)[3], 140	See Footnote 4	C+/65%
Thompson Rivers Uni.	PHYS 1150, EPHY 1150	See Footnote 5	C+/65%
UBC (Pre-2018)	(153&170)	(153&170)	C+/65%
UBC (2018 onward)	TBD	TBD	C+/65%
Uni. of Fraser Valley	111	(111&112)	C+/65%
Uni. of Northern BC	TBD	111, See Footnote 6	C+/65%
Uni. of Victoria	102	102	C+/65%
Van. Community College	1100	(1100&1200)	C+/65%

Table 3 Notes:

- Students must apply for course credit and each application is subject to Institute approval.
- When both a letter grade and a % grade are given, the more favourable grade will be considered.
- Notation: (x&y) means courses x and y are both required, while x, y means either course x or course y is required.
- PHYS 1192 covers kinematics, dynamics, equilibrium, stress, strain, work and energy, conservation of energy, linear momentum and collisions, rotational motion, and simple machines.
- PHYS 2192 covers fluids at rest and in motion, viscosity, calorimetry, thermal expansion and stresses, simple and damped harmonic motion, standing waves, resonance, electric field and potential, DC circuits, magnetism, induction, and AC circuits
- Fluids and heat are treated differently in chemistry courses, and these courses cannot be used for transfer credits.

Table 3 Footnotes:

(1) Capilano PHYS 110 and PHYS 111 are insufficient.
(2) Kwantlen PHYS 1220 has an insufficient overlap with PHYS 2192.
(3) SFU Phys 120 has no lab, need 131 or 132, or other lab course.
(4) SFU PHYS 121 has an insufficient overlap with PHYS 2192.
(5) TRU PHYS 1250 and EPHY 1250 will be considered on a case-by-case basis (no fluid dynamics).
(6) UNBC PHYS 111 covers fluids and heat (not stated on web description).

Camosun College

Chris Avis	Camosun College	avisc@camosun.bc.ca

Information added at the meeting

- Physics numbers about the same
- Chris was unable to attend due to his apartment building being on fire. He and his cat are fine, but could not travel to the meeting.

Camosun College Department of Physics and Astronomy
Articulation Report - May 2019

At our Lansdowne campus, we offer college prep PHYS 101 as well as first year courses: PHYS 104/105 (algebra-based) and PHYS 140/141 (calculus-based) and enrollment in these courses has remained fairly steady. We are noticing increased interest in Physics 104, which can be used as an entry requirement to college programs such as Medical Radiography and our 1st year Engineering Transfer. Astronomy courses (ASTR 101/102) continue to attract students in large numbers and we have continued to maintain increased offerings with 3 sections per semester. The second year courses at our Lansdowne Campus (PHYS 200, 210, 214 and 215) remain closed since 2010.

The department also delivers service courses that are restricted to students in certain career programs. We offer MRAD 165, a Radiology Physics and PHYS 160 (Biomechanics) as a service course for PISE (Pacific Institute for Sport Excellence). Our remaining service courses are for various engineering programs offered at the Interurban campus and include engineering-restricted sections of PHYS 101 and 104 as well as courses focusing on mechanics, electricity and magnetism (PHYS 157), 2nd year electricity and magnetism (PHYS 210), renewable energy (PHYS 272) and waves, optics and E&M (PHYS 295). Additional sections of PHYS 140 and 141 planned for 2019 for students in the Civil Engineering Bridge to UVic have been put on indefinite hold along with the rest of that program.

We have recently completed development of PHYS 070, a new, tuition-free 0-level ABE Physics 11 course. This course will serve as an alternate pre-requisite to PHYS 101 for entry to PHYS 104 and was expressly designed with the intent of being transferable on the ABE transfer grid. We plan to continue to run 101 (in part for the benefit of international students) while the new course is piloted. It is anticipated that this new course will not lead to any overall growth in the department unless there is unexpectedly strong student demand as sections of the 0-level course will be added at the loss of sections of 101. We are also in the process of adjusting the curricula in PHYS 104 and 105 with the intent of better aligning these courses with UVic's 102A and 102B courses.

We have been attempting to find ways to better advertise and grow our department in recent years. In Fall 2018 and Winter 2019, we offered night sections of ever-popular Astronomy 101 and 102 at our Interurban campus with the intent of offering these courses to a different demographic. Unfortunately, registration in these sections was disappointing and it seems like much of the interest in these courses comes from Lansdowne students looking for university transferable electives. Thus, we will be offering these night sections at the Lansdowne campus in the following year. We are limited in our ability to develop new courses as there is little support for any new courses that are not university-transferable to other institutions (particularly UVic).

The demographic of the college is gradually changing. Over the past few years, Camosun has made a major effort to recruit international students to the college. The main issues that are observed here amongst science instructors are weak language skills and occasionally poor transfer credit assessment, with the result that some of these students are placed in courses that are too advanced for their abilities. In particular, in the past year there has been an enormous influx of students from India, many of whom perform very poorly across the board in Arts and Science.

There is a continuing trend of domestic students seeming to be more and more ill-prepared for the rigours of a full college workload and suffering from more mental health problems. Anecdotally, it seems that this is due, to a large extent, to students having to work more than ever to afford to attend school as well decreasing standards in high school courses. Many students report heightened anxiety surrounding testing and faculty have been encouraged to find alternative means of evaluating students. There is also interest in the School of Arts and Science in how the new K-12 curriculum will impact students coming into the college and at least

one of our faculty members will be using her development time this summer to consider this issue.

Finally, Physics and Astronomy are participating in a week-long Science camp being offered by the college in conjunction with South Island school districts. The four-day camp aims to target students in Grades 9-12 and we hope that this will be a good outreach / promotional opportunity for the college.

Chris Avis
Department of Physics & Astronomy
Camosun College

Capilano University

Lauren Moffatt	Capilano University	laurenmoffatt@capilanou.ca
Bruno Tomberli (not at the meeting)	Capilano University	brunotomberli@capilanou.ca

Information added at the meeting

- Physics numbers about the same – did cancel one course
- New cosmology course ASTRO 142 first year and second year fluid dynamics course PHYS203
- General science degree under development and upgrading PHYS 110,111 to 112, 113.
- Applied Clean Technology degree under development
- Articulation requests coming your way for third and fourth year lab courses

Capilano University Articulation Report - May 2019

This year we offered: Introductory Physics (PHYS 104 x4), "calculus-based" (PHYS 114 x5, 115 x2), Physics for Engineers (PHYS 116 x2), and our astronomy course ASTR (106 x2). Compared to 2017-2018 we are down one section of PHYS 115 and up one section of PHYS 104. The additional offering of PHYS 104 is due to the new transition engineering program requirements (2-year transfer program). The loss of the 115 section was due to low enrollment.

For 2019-2020, we will be able to offer a similar course offering as 2018-2019 with a few modifications. The changes from 2018-2019 to 2019-2020 are summarized in the table below:

	2018	2019		2019	2020
	Fall	Spring		Fall	Spring
Astr 106	1	1		1	0
Astr 142				0	1
Phys 104	3	1		3	1
Phys 114	2	3		2	3

Phys 115	1	1		1	1
Phys 116	1	1		1	1
Phys 203				0	1

We have introduced a new Astronomy course, “ASTR 142: Introduction to Cosmology – The Story of the Universe”. Additionally, we will be offering a second-year physics course, “PHYS 203: Fluid Mechanics I - The Physics of Flow”. This is being offered both as an option four our engineering students, and for our second year Associate of Science students who need second year options.

There are also two additional courses, PHYS 112, and PHYS 113, which are standard first-year physics courses designed for Life Sciences students. If these courses receive any transfer status, we will offer one of each in place of Phys 114 and 115 respectively.

Total enrollments for PHYS courses remain relatively consistent with 2017/2018. There was no change in textbooks used from 2017/2018.

Additionally, Capilano University is currently in the process of developing new degrees. Currently we are working towards a Bachelor of Science General (at Stage II of development), and three majors:

- Bachelor of Science with a Major in Life Sciences
- Bachelor of Science with a Major in Data Science
- Bachelor of Science with a Major in Applied Clean Technology.

The majors are currently at Stage I of development. Our department has been working primarily on the Applied Clean Technology major (alongside the Chemistry department), and there will be a few 3rd and 4th year courses coming through for articulation soon.

Coast Mountain College

Regan Sibbald	Coast Mountain College	rsibbald@coastmountaincollege.ca

Information added at the meeting

- Physics numbers increasing so had to open two lab sections. First time ever.
- Offering videoconference of 1st-year calculus-based Physics to Prince Rupert.

Coast Mountain College (Formerly Northwest Community College)
Physics Articulation Report 2019

Coast Mountain College (CMTN) serves the rich and diverse communities and learners of BC's beautiful northwest region including Terrace, Kitimat, Smithers, Prince Rupert, and Haida Gwaii.

Due to international students from Mexico, India, and the Philippines, we had more students than ever in physics at the Terrace campus (25) and had to run two lab sections for the first time. Enrolment in Prince Rupert remains small but we hope to remedy that for next year.

We continue to run algebra-based physics 101/102 (introduction to physics) in Prince Rupert and in Terrace, and one section of calculus-based physics 121/122 (advanced physics) in Terrace which will have the lecture video-conferenced to Prince Rupert with face-to-face lab sections in both campuses. At both campuses the class sizes are maxed out at 18 which is the maximum permitted in our labs. Both courses have 3 hours of lecture and 3 hours of lab each week for fourteen weeks and then one week for final exams in each term (Fall and Winter). Most of our advanced physics students continue in an engineering program at another institution, however this year we have students moving on to physics, chemistry, mathematics, and computer science degrees at other institutions.

There will be no change in curriculum, and we will be using OpenStax textbooks this year for both courses again. Our engineering and physical sciences transfer certificate offers the following courses.

COURSE #	COURSE NAME	CREDITS	HOURS	PREREQUISITES
Math 101	Calculus I: Differential Calculus	3.0	67.5	Principles of Math 12 or Pre-Calculus 12 or MATH 115 or MATH 0501/0502
Math 102	Calculus II: Integral Calculus	3.0	67.5	A grade of C or better in MATH 101 or its equivalent
Phys 121	Advanced Physics I	3.0	90	Physics 12 or PHYS 050 and Principles of Math 12 or MATH 111 or MATH 0501/0502 or Pre-Calculus 12
Phys 122	Advanced Physics II	3.0	90	Phys 121
Chem 101 or Chem 111	Introductory Chemistry I	3.0	90	CHEM 11 or CHEM 040 or CHEM 0401/0402 and Principles of Math 11 or MATH 0401/0402 or Pre-Calculus 11
Chem 122	Principles of Chemistry II	3.0	90	Chem 101 and Math 101
CPSC 123	Computer Programming	3.0	90	Principles of Math 12 or MATH 0501/0502 or MATH 115 or Pre-Calculus 12
Math 235	Linear Algebra	3.0	45	MATH 101 or Equivalent
Engl 101	University Writing	3.0	45	English 12 or Equivalent
Engl 151 or Engl 102 Or: Engl 1011102102	Technical Writing I Or: Introduction to Literature	3.0	45	English 12 or Equivalent
	TOTAL	30	720	

Regan Sibbald
College Professor - Physics and Mathematics CMTN Terrace
rsibbald@coastmountaincollege.ca (250) 635-6511 ext. 525

College of New Caledonia

Barbara Rudecki	College of New Caledonia	rudecki@cnc.bc.ca

Information added at the meeting

- Physics numbers about the same, slight decline, especially in engineering transfer
- Medical imaging degree means new courses.
- Lots of international students, mainly from India.
- Civil Engineering technology program being developed, will include two physics courses.

2019 Physics Articulation Report

CNC offers UT calculus-based (PHYS 101/102, PHYS 204) and algebra-based physics courses (PHYS 105/106) to accommodate first year engineering transfer and general science transfer programs.

PHYS 101 - Introductory Physics I – 48
students PHYS 102 - Introductory Physics II –
12 students PHYS 105 - General Physics I – 8
students PHYS 106 - General Physics II - 8
students PHYS 204 - Mechanics I Statics - 10
students

This year, algebra-based PHYS 105/106 courses were delivered via video conference, with the lectures broadcasted from Prince George to Quesnel and the labs delivered locally in Quesnel and Prince George. We are continuing delivery of calculus-based PHYS 101/102 in both fall and spring

semesters.

Physics Department also offers two physics courses for the Medical Radiography Program: PHYS 115 - Medical Radiography 1 and PHYS 225 - Medical Radiography 2. The maximum enrolment in these courses is based on the cohort admission, currently 18 students.

First Sonography Program intake (8 students) started in January 2019 and first physics course PHYS 170 was delivered this spring. Next two physics courses, PHYS 173 and PHYS 175, are scheduled for intersession and fall 2019.

Civil Engineering Technology Program is being currently developed. This program will start in September 2020 and will bring 2 physics courses to out department.

Barbara Rudecki
Department of Physics & Applied
Science College of New Caledonia

College of the Rockies

Trevor Beugeling	College of the Rockies	tbeugeling@cotr.bc.ca

Information added at the meeting

- Physics numbers about the same, maybe a very small decline
- New math instructor is also a physics person – welcome to Ben Tippet

College of the Rockies Physics Articulation Report May 2019

College of the Rockies continues to have steady enrollment in our first-year calculus-based physics courses (PHYS 103 & 104). The fall 2018 semester started with 20 students enrolled in PHYS 103, dropping to 18 by December. All 18 students passed. In the winter 2019 semester, 12 students were registered In PHYS 104. All 12 students wrote the final exam. Final grades are yet to be calculated, but all students are expected to pass.

Our Engineering Mechanics courses (PHYS 141/170) have also maintained steady enrollment, with 9 students registered this year in the two courses combined (5 in 141, and 4 in 170).

We did not have any students registered in our second-year physics courses this year.

We also continue to offer grade 11 & 12 equivalency courses (PHYS 80 and 90), as well as an Elementary Astronomy course (ASTR 100).

Columbia College

Tara Todoruk	Columbia College	ttodoruk@columbiacollege.bc.ca

Information added at the meeting

- Physics numbers about the same
- Basic physics for non-science students for articulation, very light on the math and an environmental green focus “Physics for Future Presidents”.

Columbia College
Vancouver, Canada

2019 Physics & Astronomy Articulation Report 2019

Columbia College is completing our sixth year at our new campus and enrollment is at a record high for the college. Although the physics department has grown substantially over the past seven years, over the past 4 or so, enrollment in UT physics has stabilized but enrollment in high school physics is on the rise.
In 2018/19 Columbia College ran seven Physics courses, with six of them at the UT level and 2 at the secondary level:

- Physics 110 (Calculus based Newtonian Mechanics) S18 F20 W16
- Physics 120 (Calculus based Electricity and Magnetism) S4 F11 W10
- Physics 130 (Calculus based Optics and Thermodynamics) S6 F12 W16
- Physics 118 (Engineering Mechanics) W15
- Physics 200 (Modern Physics) W2
- Physics 205 (Thermal Physics) F1
- Physics 11
- Physics 12 S30 F20 W32

The enrollment is fairly stable in our UT program. Throughout the 2018-2019 academic year, there has been a total of 3 sections of Physics 110 (average of

18 students each), 3 sections of Physics 120 (average of 9 students each), 3 sections of Physics 130 (average of 12 students each), and 1 section of Physics 118 (16 students). Our second-year enrollment is low. Physics 205 was only offered one time, as a directed study course with enrollment of 1. Physics 200 was offered one time, as a directed study course with enrollment of 2. Typically Physics 200 and 205 are offered in alternating semesters. Enrollment in Physics 11 is increasing (21 students in the fall semester), and the enrollment in Physics 12 is high with a full class of 32 last semester. Throughout the year, Physics 11 is offered every second semester but Physics 12 is now being offered every semester (instead of every second). We have started to teach the new curriculum into teaching these courses.

We have prepared a second -ear Electromagnetics course that we hope to offer in the near future and are have sent a basic physics for non-science students for articulation, which we hope to offer in the upcoming academic year.

Tara Todoruk Columbia College Vancouver, BC

Coquitlam College

Janusz Chrzanowski	Coquitlam College	janusz@coquitlamcollege.com

Information added at the meeting

- Physics numbers about the same
- No changes to Physics curriculum.
- Offering first-year University Transfer courses.
- Huge influx of Indian students. 1500, 1600 students before, now 3000.
- Opening a second campus in Surrey.

COQUITLAM COLLEGE
Established 1982

Coquitlam College Report to Articulation May 2019

There were no changes in the Physics Curriculum at Coquitlam College during the last academic year. We continue to offer 1st year calculus-based Physics courses. Physics 101 (mechanics with an introduction to thermal Physics) is offered in the summer and the fall semesters, Physics 102 (electricity, magnetism and optics) is offered only once a year in the spring semester. There are no plans for the second year courses.

The enrolment in Physics courses so far has been stable. As a rule, the classes of Physics 101 are full (40 students = 2 lab sections), and the number of students enrolled in Physics 102 ranges from 12 to 18.

There have been significant changes in student demographics at Coquitlam College. During the past academic year we experienced a substantially increased influx of Indian students, and a declined number of Chinese and other international students. The number of students enrolled at the College recently increased to almost 3000 so that the administration of the College had to open a new campus in Surrey.

Corpus Christi College

Hamid Maghzian	Corpus Christi College	hmaghzian@corpuschristi.ca
Alain Prat	Corpus Christi College	aprat@corpuschristi.ca

Information provided at the meeting

- Physics numbers about the same, small increase

Report from Corpus Christi College
(Physics and Astronomy articulation meeting) 2019
Represented by Dr. Hamid Maghzian

Founded in 1990, Corpus Christi College is a Catholic two-year liberal arts college located on UBC's campus. The college offers over ninety courses in a variety of subjects, including physics and astronomy courses. Approximately 20% of the students at the college are international students.

Here is the list of recent courses offered at the college and the enrolment numbers:

ASTR 201 Astronomy (Exploring the universe: The solar system)
PHYS 100 Introductory Physics (Mechanics and Heat)
PHYS 101 Fluids, Vibrations and waves

<u>ASTR 201 Enrolment Numbers:</u>
Summer 2016 Semester – 8 Students
Summer 1 2018 Semester – 7 Students
Summer 1 2019 Semester – 6 Students (to April 11, 2019)

<u>PHYS 100 Enrolment Numbers:</u>
Winter 2019 Semester – 21 students (Continuing Education Online Course)

PHYS 101 Enrolment Numbers:
Fall 2015 Semester – 11 students (Face-to-Face Course)
Fall 2016 Semester – 12 Students (Face-to-Face Course)
Winter 2018 Semester – 10 Students (Face-to-Face Course)
Fall 2018 Semester – 13 Students (Continuing Education Course)
Winter 2019 Semester – 23 Students (Face-to-Face Course)
Winter 2019 Semester – 14 Students (Continuing Education Online Course)
Winter 2020 Semester – Scheduled to be offered Face-to-Face

Douglas College

Jennifer Kirkey	Douglas College	kirkeyj@douglascollege.ca
Will Gunton	Douglas College	guntonw@douglascollege.ca

Information provided at the meeting

- Physics numbers about the same, small increase
- Lots of discussion at the College about the percentage of International students, in particular in the Business Departments

- We recognize and acknowledge the QayQayt (Ki-Kite) First Nation, as well as all Coast Salish Peoples, on whose traditional and unceded territories we live, we learn, we play, and we do our work.
- Offered a course in modern physics as a guided study in the Fall 2018 and Winter 2019.
- Will be offering our PHYS1108 course for the first time in the fall. This matches SFU's Physics for Life Science students – calculus based. Using open source OpenStax University Physics and UBC Calculus as the book(s).
- Looking for help with first Canadian edition of the astronomy book. Please talk to Jennifer Kirkey if you are interested in helping with this.

Number of Students and Faculty

The college as a whole has increasing numbers. We are full. The College has put a cap of about 15% on International Students. We have rented space in the Anvil Centre just downhill from the main campus in New Westminster. It will house primarily Commerce and Business classes. The College owns land across 8th Street and while discussions of a new building are beginning, it will be many more years before that happens.

Physics is bigger than we ever have been, with four full time faculty and two contract sections this summer. We have two full time lab instructors who work during the day, and several contract lab instructors to help with the night time astronomy labs.

Engineering Program is still small with 5 students in our second year.

Course	Number of students	Change	Textbook
PHYS1104	105	Same (small decrease)	Custom based on Open Stax College Physics
PHYS1107 (algebra) (life science stream)	135	Same	Custom based on Open Stax College Physics
PHYS 1207 (algebra) (life science stream)	34	Increase of 5%	Custom based on Open Stax College Physics
PHYS1110 (Calculus)	90	Same	Halliday, Resnick and Walker
PHYS1210 (Calculus)	60	Same	Halliday, Resnick and Walker
PHYS 1170 Mechanics for Engineers	27	Same, small decrease	Hibbeler
PHYS2250 Modern Physics-Q	6	New course = infinite increase in the number of students	Krane, K. Modern Physics
ASTR1105 (liberal arts majors)	120	Same	Custom based on Open Stax Astronomy

We are using custom editions of the open source OpenStax textbooks.
We are focusing on a Canadian Edition of OpenStax Astronomy.
You can view it at https://pressbooks.bccampus.ca/astronomy2/
Please contact me if you would like to help with this project, or to modify it for your institutions. The publishing program is PressBooks.

Second Year Courses

We have articulated two new second year courses – Classical Mechanics and Modern Physics. They will be run on a one by one "guided study" basis as we do not yet have enough demand. Six students for Modern Physics in the Winter 2019 course.

Outreach and Elementary Schools

I do active outreach with Science World and the Scientist and Innovators in the Schools program. I visit an elementary school to do hands on science workshops about once a month. https://www.scienceworld.ca/sis
Douglas also offers MSTE, a Post-Graduate program for Elementary School teachers to help them with Math and Physics. Jennifer co-teaches one of the six courses in that program. This program runs as a cohort every two years, with about 20 people per cohort.
https://www.douglascollege.ca/programs-courses/catalogue/courses/MSTE

Kwantlen Polytechnic University

Takashi Sato	Kwantlen Polytechnic University	Takashi.Sato@kpu.ca
Michael Poon	Kwantlen Polytechnic University	Michael.poon@kpu.ca

Information provided at the meeting

- Physics numbers about the same, small increase
- Cut down student numbers. All departments to decrease by 4.5% this year and 1.5% each year up to 10% . KPU is downsizing – want to cut down student numbers – 4% this year and another 5.5% over four years. Some permanent faculty have received layoff notices.
- The administrators realized that international students were actually causing the college money due to the need for extra services, etc.
- More graduates for BSc. Physics for Modern Technology.
- Still doing remotely-operated labs – 'cloud lab'.
- Opened Surrey Civic plaza (shared with SFU) – and need to fill it now.

Physics Articulation Committee – Institutional Report
Kwantlen Polytechnic University **April 2019**

Kwantlen Polytechnic University has campuses in Richmond, Surrey, Cloverdale and Langley and the Physics Department operates on three of them. At Langley Campus, PHYS 1400 & 1401 run as part of the long standing Environmental Protection Technology program. At Surrey and Richmond Campuses, we run our complement of first year courses in physics and engineering, as well as our various courses in astronomy for non-majors. In addition, Richmond Campus is home to

the 2nd, 3rd and 4th year courses for the *B.Sc. Physics for Modern Technology*, as well as the upper level lab opened in September 2016.

The first year of this degree curriculum is a familiar mix of science courses but due to the very applied nature of this program, courses become specific for our degree from second year onwards. We see students transferring into our degree after (and during) first year fairly seamlessly but those arriving with some second and third year credits are seeing some glitches, as one normally would when changing majors mid-stream.

At the request of administration to reduce cost, we have re-worked the timetabling of the upper level courses so that many third and fourth year courses run on alternate years. The experience turned out reasonably smoothly.

We continue to offer online lab sections of PHYS 1100 as well as online "lecture" sections, an experience made smooth through the work of Jillian Lang. We allow students to mix and match the lectures and labs from any mode, any campus. In the online labs, students perform experiments using home kits built around the IOLab (http://www.iolab.science/) and remotely operated equipment. Although the Remote Web-based Science Lab (RWSL) located at North Island College is no longer available, we have established our own nodes, now called "CloudLab" at the Richmond campus, where we currently run an inclined track experiment and a e/m experiment. In addition to KPU's own students, a section of students from University of Regina ran the inclined track experiment in Fall 2018.

Takashi Sato

Langara College

Erfan Rezaie	Langara College	erezaie@langara.ca

Information provided at the meeting

- Physics numbers about the same, small increase
- Physics 11 equivalent is increasing, but Physics 12 decreasing as the students need the more basic course, primarily International Students.
- More courses in the summer.
- Polled the room – most people have a 3 hour lab and most institutions have the lab as part of the course. SFU said that it is the biology that does not require a lab as part of first year physics. UBC and Capilano thinking about having labs separate from the course.

Langara.
THE COLLEGE OF HIGHER LEARNING.

Langara College Physics and Astronomy Articulation Report 2019

Submitted by Bradley Hughes & Erfan Rezaie: bhughes@langara.ca & erezaie@langara.ca

Labs:

One of our department's main efforts in the 2018-2019 academic year was to redevelop the first-year physics labs. We based these mainly on the UBCV SQI labs (PHYS 119). A committee was formed in March 2018 and with help from our Teaching and Curriculum Development Centre (TCDC), we developed the learning outcomes for our first-year physics labs. We implemented a pilot version of these new labs in Spring 2019 that ran with our PHYS 1125 (Physics I with Calculus) course. As our labs run for 2-hour blocks per week, our adaptation of the UBCV PHYS 119 3-hour labs were such that we ran one experiment over two weeks-sometimes three-thus reducing the number and variety of experiments we could run (Hooke's Law, Pendulum, Coffee Filter drop, and SHM).

Despite covering less material, as we ran this sequence of adapted labs, we observed that the students were particularly struggling with time. We believe this increased struggle is due to two sources: 1. Our student population has a more diverse academic background than is expected at UBC; 2. Our students are taking this sequence of labs at the same time as their first university-level physics course, not after as in the case of UBC students.

The students surveyed and interviewed demonstrated that we successfully achieved most, if not all, our intended learning outcomes, some with far greater mastery than

others. The main recommendation identified was a change from 2-hour to 3-hour labs. Such a change would also allow us to have a larger variety of experiments with the same learning outcomes. We are currently looking into this change. Another consideration is to separate the lab credit from the course, as with UBCV and other institutions, but this requires much further consultation as it involves changes in workload structure for faculty and staff.

Physics for Life Sciences:
We are looking into changing the curriculum of our PHYS 1101 (Physics I for Life Sciences) course to be more in-line with UBCV PHYS 101 (Fluids, SHM, Waves, Sound, Interference, including Diffraction). This will likely require a re-articulation for transfer. The motivation behind this is to have a well-defined separate stream for students in life sciences vs. physical and applied sciences, whereas we currently have most of our enrollment in our 1125 (physical/applied science stream) and low enrollment in our 1101 (life science stream) due to a lack of direct transfer and similar curriculum with UBCV PHYS 101.

Staffing:
We currently have 9 full-time faculty (not all permanent), and two recent part-time faculty hires for the summer 2019 term, for a total of 11 faculty members, and 5 lab demonstrators.

Enrollment overview in the 2018-2019 academic year:
Domestic and international student enrollment both remain steady. We have growth in our PHYS 1114 (Grade 11 equivalent) sections due to our increased math pre-requisite requirement for PHYS 1118 (Grade 12 equivalent) driving more international students to take PHYS 1114 instead.

Enrollment details in the 2018-2019 academic year:
We ran 43 sections of physics and astronomy courses, down from 46 last year. By semester we offered 6 in summer 2018, 18 in fall 2018 and 19 in spring 2019.

Astronomy Courses
We ran ASTR 1101/3310 (one half-section of 1101 (for Science students) and one-half section of 3310 (for Arts students)) in the fall with the similarly organized ASTR 1102/3311 course in the spring. Continuing the trend from previous years we are seeing a decline in enrolment for the 3310/3311 sections which may be due to the competition from a growing number of elective arts courses being offered at the college.

Introductory Courses

We ran 3 sections of PHYS 1114 (Grade 11 equivalent) in the fall and another 2 sections in the spring. Registration has been increasing in this course, probably because we require international students from the life sciences stream in high school in India to start with this course unless they write the diagnostic test.
We ran 13 sections of PHYS 1118 (Grade 12 equivalent) which is our most popular course. Two in the summer, 5 in the fall, and 6 in the spring.
For this course we use the OpenStax College Physics textbook, which is free to all students.

1st-Year Courses

We ran 11 sections of PHYS 1125 (Physics I with Calculus) and 3 sections of PHYS 1101 (Physics I for Life Sciences). For 1125 we ran 6 sections in the fall and 3 sections in the spring as well as 2 sections in the summer. For 1101 we run one section every semester. We are seeing declining interest in this course and we rarely have wait lists for it.
We ran 5 sections of PHYS 1225 (Physics II with Calculus). We are getting increasing enrolment in the spring semester (3 sections) as we have expanded our ENGT/ENGD programs and those students take the course in the spring semester. Demand for the course is much lighter in the other semesters.

2nd-Year Courses

We ran our 2nd-Year physics program again this year. In the fall semester we had 11 students start in PHYS 2424 (Relativity and Quanta) and 6 students in PHYS 2309 (Intermediate Physics Lab I). In the spring semester we had 4 students in PHYS 2323 (Newtonian Mechanics) and 4 students in PHYS 2409 (Intermediate Physics Lab II). This is more or less the same as the previous years' enrollment.

Other Courses

We ran 2 sections of PHYS 1219 (Engineering Mechanics), both in the spring semester.

North Island College

Dennis Lightfoot	North Island College	Dennis.Lightfoot@nic.bc.ca

Information provided at the meeting

- Physics Enrollment in all first-year physic courses was down this year, and attrition continues to be high.
- Enrolments were down – all the way to zero in Port Alberni for 2nd semester.
- Adding two second-year Physics courses next year – need options for Associate of Science students that isn't just Biology.
- Astronomy offered face-to-face in Comox Valley, may alternate with other campuses the other years.
- Will be hiring at least two sessional instructors for following year. Please contact Dennis if you are interested.

NORTH ISLAND COLLEGE

NIC Physics Articulation Notes 2019

Starting in September, we will have the following first and second year university transfer courses:

- PHY 100/101 – Two semesters of algebra based physics, primarily for life science students
- PHY 120/121 – Two semesters of calculus based physics, for engineers, physicists, and most chemists
- PHY 141/170 – Engineering Mechanics (PHY 141 transfers to UVic Engineering, and PHY 170 transfers to UBC Engineering)
- PHY 216 - Electricity and Magnetism (based on UVic's course of the same name)

- PHY 215 – Introduction to Quantum Physics (also based on UVic's course)
- SSA 100/101 – Introductory Space Science and Astronomy courses, for non-majors.

This year will be the first time we will have second-year physics courses. The new courses are being funded through our international office, as international students wanting to complete an Associate of Science degree at NIC were asking for more options that just Biology (we have had 5 second year biology courses, but no second year physics). Hopefully the additional offerings will also be attractive to domestic students, who may also decide to stay for two years and an Associate of Science degree before moving on.

This year, the SSA courses are going to be offered at our Courtenay campus, where it is expected that enrollment will be high among Associate of Arts students as their required lab-science course.
Enrollment in all first-year physic courses was down this year, and attrition continues to be high.

- SSA 100/101 – Space Science and Astronomy for non-science majors

Enrollment in both streams of first year physics continue to be strong at our Courtenay Campus, and are modest but steady at Campbell River and Port Alberni campuses, where the courses are typically delivered by ITV (teleconference), with labs delivered face to face at each campus.

We will be switching to the Open STAX textbooks for both streams of first year physics for 2018/19 ("College Physics" for PHY 100/101, and "University Physics" for PHY 120/121).

Our Space Science and Astronomy courses were revived last year, and are going to be offered again this year. The course will be offered by ITV into our Port Alberni and Campbell River campuses, and will also be offered as dual credit to some high schools in our region. We are using the Open STAX astronomy textbook.

Northern Light College

Lisa Verbisky	Northern Lights College	lverbisky@nlc.bc.ca

NLC is offering an Engineering Program.

Lisa Verbisky will be attending the Engineering Articulation

They do have a physics instructor, but that person is contract only and there is no funding to attend physics articulation.

Lisa Verbisky, M.Sc., Inst. Dip.
Northern Lights College
Associate Dean, Academic and Vocational Programs
Room 211, Main Campus FSJ
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Okanagan College

Ryan Ransom	Okanagan College	RRansom@okanagan.bc.ca
Robert Stutz	Okanagan College	

Information added at the meeting

- Enrollment in all first-year physic courses was up and the Kelowna campus is full, primarily thanks to International Students.
- Second year physics courses are being offered with about 10 students
- Changes to first year courses for the Common Core Engineering curriculum. PHYS111 and PHYS121 undergoing revision – increasing to four lecture hours per week and closer matching of content to the common first-year Engineering curriculum.
- Using OpenStax College Physics for our algebra-based stream.
- 25% attrition rate

Okanagan College – 2018/2019 Physics & Astronomy Articulation Report

Okanagan College has four campuses: Kelowna, Penticton, Vernon, and Salmon Arm. Kelowna is our largest campus, making up ~65% of Arts & Science students.
Okanagan College has four main campuses: Salmon Arm, Vernon, Kelowna, and Penticton. Kelowna is our largest campus, accounting for ~65% of Arts & Science students.
Recent enrollment history at OC for the Associate of Science across all OC Campuses:

	2013 – 2014	2014 – 2015	2015 – 2016	2016 – 2017	2017 – 2018	2018 - 2019
Applied	663	629	772	773	1005	925
Enrolled	284	273	294	319	417	346

Enrollment notes:

- Our numbers continue to be bolstered by international students, primarily from India. The College has started to send international students to campuses other than Kelowna as of Fall 2018. The Kelowna campus is essentially at capacity for student numbers.

Course/Enrollment Updates:

- Our courses offered at Okanagan College remain mostly the same:

	17-18 Numbers	18-19 Numbers
PHYS112/122 – Algebra-based Introductory Physics I & II	217 130	250 128
PHYS111/121 – Calculus-based Physics I & II	14	22
PHYS125 – Physics for Electronic Engineering	6	3
PHYS200 – Relativity and Modern Physics	18	12
PHYS215 – Thermodynamics	8	7
PHYS202 – Engineering Mechanics I		
ASTR110/111/112/120/121/122 – Astronomy I & II	72	80
ASTR220 – Astrobiology	14	22
ASTR230 – History of the Universe	23	24

- New courses on Calendar:
  - PHYS126 – Revised version of PHYS125 for ELEN, to start Fall 2019.
  - PHYS290 – Directed Studies. We had our first student this Winter 2019 semester.
- Course changes:
  - PHYS111 and PHYS121 are moving from three to four lecture contact hours per week, starting Fall 2019. This change is to meet the requirements of the Common First-Year Engineering Curriculum (CFYEC), though we've been asking for the extra hour for pedagogical reasons for a number of years. Minor content changes will also be implemented to more closely align the course with the CFYEC requirements; existing course transfers are expected to hold.

Textbook Changes:

- For our algebra-based Physics courses (PHYS112/122), we used the OpenStax *College Physics* text for the first time. The text was well received by students and professors, but we continue to note that student utilization of textbooks is very low, whether the texts are free or paid for.

Attrition: remains around 20-25% from Fall to Winter semester.

Selkirk College

Raoul Kemper	Selkirk College	rkemper@selkirk.ca

Information added at the meeting

- Enrollment in all first-year physic courses had a small drop
- Large attrition rate in algebra-based course – smaller in Calculus-based course.

Selkirk College

Physics and Astronomy Articulation Report

Phys 102 (Fall) Basic Physics 1:
2017 – 34 students
2018 – 32 students
BOOK: Physics, 10th Edition, by Cutnell & Johnson

Phys 103 (Winter) Basic Physics 2:
2018 – 20 students
2019 – 19 students
BOOK: Physics, 10th Edition, by Cutnell & Johnson

Phys 104 (Fall) Fundamental Physics 1:
2017 - 36
2018 - 24
BOOK: Fundamental Physics, 10th ed. Wiley

Phys 105 (Winter) Fundamental Physics 2:
2018 - 30
2019 - 18
BOOK: Fundamental Physics, 10th ed. Wiley

Phys 200 (Fall) Principals of Mechanics:
2017 - 21
2018 - 14
BOOK: Statics (Hibbeler)

Simon Fraser University

Barbara Frisken	Simon Fraser University	frisken@sfu.ca

Additional Information shared at the meeting

- SFU is hosting the CAP Canadian Association of Physics conference from June 4-8 2019. Special rates for college and high school instructors. $25 for college teachers. Physics education is a big part of CAP.
- No longer offering PHYS221 - no 2nd year Electromagnetism, only at 3rd and 4th year. Previously PHYS221 was for engineering, but they do their own now.
- Dip in first-year enrolment.
- Python programming course required for pure Physics and Math majors, but not all Physics majors.

SFU

SFU Departmental Report 2019

PHYS 321 - Intermediate Electricity and Magnetism (3)

Development and application of Maxwell's equations in vector differential form. Notation and theorems of vector calculus; electric charge, fields, potentials, capacitance and field energy; conductors; methods for solving electrostatic problems; electric fields in matter; electrical current and the magnetic field; Ampere's law and the vector potential; magnetic fields in matter; electromotive force, electrical resistance, Faraday's law and inductance; Maxwell's correction to Ampere's law and electromagnetic waves. Prerequisite: PHYS 121 or 126 or 141 (or PHYS 102 with a minimum grade of B); MATH 252 or 254; MATH 310, with a minimum grade of C-. Students with credit for PHYS 221 may not take this course for

further credit. Quantitative.

PHYS 421 - Electromagnetic Waves (3)
A continuation of PHYS 321: properties of electromagnetic waves and their interaction with matter. Transmission lines and waveguides; antennas, radiation and scattering; propagation of electromagnetic waves in free space and in matter; reflection and refraction at boundaries; polarization, interference and diffraction. Prerequisite: PHYS 321 (no substitution); PHYS 255 or ENSC 380. Students with credit for PHYS 324 or 425 may not take PHYS 421 for further credit. Quantitative.

- PHYS 221 was continued for Engineering, but they now offer their own courses
- All articulation agreements will be cancelled this summer. Please submit a request if you would like to have your E&M 1 articulated

1. Pythonization of the curriculum
- First computing course (CMPT 120) is in Python
- Access to Jupyter notebooks through Syzygy
- Developing analysis scripts for students to use as starting points in lower division labs
- Plan to develop a series of simulations/homework problems using the Jupyter platform for students to work on throughout the curriculum
- Plan to offer a Python boot camp for faculty members

2. PHYS 101/102 Rethinking (physics for life science students)
- Review what we are teaching and why (April 2019)
- Develop education goals
- Review textbook

3. First-year Textbook Summary:
Physics 100 (physics 12): OpenStax College Physics
Physics 101/102 (life sciences): Giancoli - Physics: Principles with applications (in process of reviewing this)
Physics 120/121 (calculus): Flipit Physics + Tipler (optional) Physics 140/141 (studio, calculus): Flipit Physics + Tipler (optional)

Physics 125/126 (enriched): Halliday, Resnick and Krane (considering Chabay and Sherwood) The complete textbook list is attached as a separate page.

4. Dip in first year enrolment but enrolment is physics courses is steady at other levels, with strong numbers particularly in second year courses.

Barbara Frisken, Chair, Physics Undergraduate
Curriculum Committee, SFU April 11, 2019

Course #	Course Name	Title	Edition/Year	Author
PHYS 100	Introduction to Physics	SFU version of OPENSTAX COLLEGE PHYSICS		Openstax
PHYS 101	Physics for the Life Sciences I	Physics: Principles with Applications	7th/2015	Giancoli
PHYS 102	Physics for the Life Sciences II	Physics: Principles with Applications	7th/2014	Giancoli
PHYS 120/140	Mechanics and Modern Physics	Flipit Physics	1st/2016	
	Studio Physics-Mechanics	Physics for Scientists and Engineers	6th/2016	Tipler
PHYS 121/141	Optics E+M	Flipit Physics	1st/2016	
	Studio Physics - E+M	Physics for Scientists and Engineers	6th/2016	Tipler
PHYS 125	Mechanics and Relativity	Physics (V1)	5th/2001	HALLIDAY, RESNICK AND KRANE
PHYS 126	Electricity, Magnetism and Light	Matter and Interactions	4th/2017	Chabay and Sherwood
PHYS 132	Physics Laboratory I	MEASUREMENTS AND THEIR UNCERTAINTIES : A PRACTICAL GUIDE TO MODERN ERROR ANALYSIS	1st/2010	HUGHES/Oxford
PHYS 133	Physics Laboratory II	MEASUREMENTS AND THEIR UNCERTAINTIES : A PRACTICAL GUIDE TO MODERN ERROR ANALYSIS	1st/2010	HUGHES/Oxford
PHYS 190	Intro to Astronomy	Astronomy	2nd/2015	GHOSE
PHYS 211	Intermediate Mechanics	CLASSICAL MECHANICS	1st/2014	TAYLOR/University Science Books
PHYS 231	Physics Laboratory III	MEASUREMENTS AND THEIR UNCERTAINTIES : A PRACTICAL GUIDE TO MODERN ERROR ANALYSIS	1st/2009	HUGHES/Oxford
PHYS 233	Physics Laboratory IV	MEASUREMENTS AND THEIR UNCERTAINTIES : A PRACTICAL GUIDE TO MODERN ERROR ANALYSIS	1st/2010	HUGHES/Oxford
PHYS 255	Vibrations and Waves	VIBRATIONS & WAVES	1/1971	FRENCH/Norton
PHYS 285	Relativity/Quantum Mechanics	MODERN PHYSICS	6/2012	TIPLER/MPS
PHYS 321	Intermediate Electricity Magnetism	INTRO TO ELECTRODYNAMICS	4/2013	GRIFFITHS/Pearson
PHYS 326	Electronics/Instrumentation	ELECTRONIC PRINCIPLES	8/2015	MALVINO/McGraw-Hill
PHYS 332W	Advanced Physics Lab I	MEASUREMENTS AND THEIR UNCERTAINTIES : A PRACTICAL GUIDE TO MODERN ERROR ANALYSIS	1/2010	HUGHES/Oxford
PHYS 344	Thermal Physics	Basic Thermodynamics	1/1994	Carrington, Gerald
PHYS 347	Intro. To Biological Physics	PHYSICAL BIOLOGY OF THE CELL	2/2012	PHILLIPS/Taylor&Francis
PHYS 365	Semiconductor Device	SEMICONDUCTOR PHYSICS & DEVICES	4/2011	NEAMEN/McGraw Hill
PHYS 384	Methods of Theoretical Physics	Mathematical Physics	1/2016	BUTKOV/Pearson
PHYS 385	Quantum Mechanics I	A Modern Approach to Quantum Mechanics	Feb-12	Townsend/USB
PHYS 390	Introdution to Astrophysics	Introduction to Cosmology	1/2002	Ryden/Addison-Wesley
		Extragalactic Astronomy & Cosmology	2/2015	Schneider/Springer
PHYS 395	Computational Physics	Numerical Recipes		
PHYS 413	Advanced Mechanics	MECHANICS (V1)	3/1976	LANDAU/Butterworth-Heinmann
		CLASSICAL MECHANICS	3/2002	GOLDSTEIN/Pearson
PHYS 415	Quantum Mechanics II	MODERN APPROACH TO QUANTUM MECHANICS	2/2012	TOWNSEND/USB
PHYS 421	Electromagnetic Waves	INTRO TO ELECTRODYNAMICS	4/2013	GRIFFITHS/Cambridge
PHYS 431	Advanced Physics Lab II	No textbook		
PHYS 332/833	Advanced Physics Lab I / Biophyics Lab	MEASUREMENTS AND THEIR UNCERTAINTIES : A PRACTICAL GUIDE TO MODERN ERROR ANALYSIS	1/2010	HUGHES/Oxford
PHYS 445	Statistical Physics	STATISTICAL AND THERMAL PHYSICS	1/2010	Gould/Prinston University
PHYS 455/855	Modern Physics	OPTICAL PHYSICS	4/2010	LIPSON/Cambridge
PHYS 465	Solid State Physics	The Oxford Solid State Basics	1/2013	Simon/Oxford
PHYS 485/871	Particle Physics	MODERN PARTICLE PHYSICS	1/2013	THOMSON/Cambridge
		INTRO TO ELEMENTARY PARTICLES	2/2008	GRIFFITHS/Wiley
PHYS490/881	Relativity and Gravitation	Spacetime and Geometry: An Introduction to General Relativity	1/2003	Carroll/Pearson
		Gravity: An Introduction to Einstein's General Relativity	1/2002	Hartle/Benjamin-Cummings
PHYS 492/881 G200	HEP Techniques	Particle Detectors	2/2008	Grupen, Claus/ Cambridge
		Introduction to Experimental Particle Physics	1/1989	Fernow, Clinton, Camridge

Thompson Rivers University

George Weremczuk	Thompson Rivers University	Gweremczuk@tru.ca

Information added at the meeting

- Enrollment in all first-year physic courses were higher this year
- A lot of students take first-year Physics in later years, so scheduling is challenging with upper-level (say Biology) courses.
- Lots of intake from India.
- Two courses in approval process: PHYS3000 – Introduction to Quantum Computing and GEOL4050 – Applied Geophysics.

THOMPSON RIVERS UNIVERSITY

Physics Articulation Report 2019

Enrollments were unexpectedly higher than anticipated this year. In the fall semester, most of the physics courses offered, other than service courses, required capacity increases to accommodate increased demand. The PHYS 1100 – Fundamentals of Physics 1 algebra-based course rose to 140 students compared to 105 in fall 2017 and 99 in fall 2016. The PHYS 1150 – Mechanics and Waves calculus-based course jumped to 80 students from 55 in fall 2017 and 28 in fall 2016 and still had a sizable wait-list at the end of registration. The larger classes presented difficulties with finding sufficient teaching assistants and sessional faculty to supervise the laboratory classes.

The larger enrollments in first-year courses were attributed to an increase in international students, mostly from India, and a change in academic advising away from suggesting that students defer the B.Sc.-required physics courses to later years. The suggested postponement in the past was intended to reduce the first-year workload so as not to overwhelm students coming in from secondary schools. What was found though was that students who deferred the first-year physics courses found the courses more difficult later because of the further time away from high school physics. This year, students who had taken Physics 12 were also encouraged to take the calculus-based course instead of opting for the “easier” algebra-based course.

Enrollment increases in the winter semester were not as dramatic. Some of this was due to attrition and some due to unfavourable scheduling.

Following from a sabbatical leave project, a revision of first-year physics labs will be tested in one of the calculus-based lab classes in the coming fall semester. Instead of the typical confirmation experiments, the first few experiments will present students with basic tools and straightforward measurements, but not clearly defined expectations, to allow students time to review and reflect on their results and, most importantly, allow students time to re-take measurements and refine their theories. After review and refinement, this approach will eventually be extended to the labs for other first-year courses.

PHYS 3000 – Introduction to Quantum Computing and GEOL 4050 – Applied Geophysics are both in the approval process.

The physics faculty are planning to review the physics program requirements this summer. The plan includes reducing the number of required courses to try to introduce more variety into the choice of electives.

We will be graduating three or four physics major students this year.

Texts used:

PHYS 1100 - OpenStax College Physics and Schaum's Outline of College Physics, 11th Edition by Bueche and Hecht

PHYS 1150 - Physics for Scientists and Engineers, R.A. Serway and J.W. Jewett, 9th edition

PHYS 1200 - OpenStax College Physics

PHYS 1250 - Physics for Scientists and Engineers, R.A. Serway and J.W. Jewett, 9th edition

PHYS 1580 - College Physics, P.P. Urone, R. Hinrichs, K. Dirks and M. Sharma, OpenStax,

PHYS 2000 - Modern Physics, Randy Harris, Pearson/Addison-Wesley, 2nd ed.

PHYS 2150 – Electric Circuits, Richard C. Dorf, James A. Svoboda, Wiley, any edition

PHYS 2200 - Analytical Mechanics, G.R. Fowles and G.L. Cassiday, Thomson Learning Inc., 7th edition

PHYS 3080 – Hecht's Optics and Pedrotti's Optics. *Since both of these texts are now out of print, suggestions for good optics texts are very much appreciated.*

PHYS 3090 – Electronic Devices and Circuits, Theodore F. Bogart, Jeffrey S. Beasley, Guillermo Rico, Prentice Hall

PHYS 3100 - Digital Design, M. Morris Mano, Michael D. Ciletti, Pearson

PHYS 3400 and PHYS 4400 – Introduction to Quantum Mechanics, Griffiths (2nd ed.)

PHYS 4140 - Dunlap's An Introduction to the Physics of Nuclei and Particles, and Krane's Introduction to Nuclear Physics

ASTR 1140/1150 - OpenStax Astronomy text.

Trinity Western University

Arnold Sikemma	Trinity Western University	Arnold.Sikkema@twu.ca

Physics at Trinity Western University

Report for the BC Articulation Committee Meeting 2019

by Dr. Arnold Sikkema Professor of Physics
Chair of the Mathematical Sciences Department Trinity Western University

- TWU Physics mainly serves our B.Sc. programs in Biology and Chemistry, as well as our pre-engineering options.
- Physics is part of our Department of Mathematical Sciences, which includes math, computing science, physics, pre-engineering.
- Arnold Sikkema, on sabbatical for 2018-19, returns 16 August 2019. However, he briefly came out of sabbatical to write and submit this report. Due to TWU not having a full-time physicist serving this year, TWU will not be sending a representative to the articulation meeting this year. (As TWU does not receive provincial funding, we are neither required nor funded to participate, but we usually do, this year being the exception.)
- For 2018-19, Prof. Rick Sutcliffe rsutc@twu.ca (Professor of Mathematics & Computing Science) remains acting Chair of the Mathematical Sciences Department and acting Coordinator of Physics. Please contact him for any articulation-related matters until August 15.
- Four of the usual classes were canceled due to very low enrolment (210: Conceptual Modern Physics; 310: Topics in Modern Physics; 230: Electricity & Magnetism; 341: Advanced Physics Chemistry I).
- All our other courses are offered on an alternate year basis, to allow students to complete a minor or concentration, with zero to three graduating per year with these options (zero this year).
- Enrolments in 2018-19 were possible due to a visiting part-time sabbatical replacement instructor:
    - 111: Fundamentals of Physics I: 39

    - 112: Fundamentals of Physics II: 31
- Courses planned for Fall 2019 are:
    - 111: Fundamentals of Physics I
    - 230: Electricity & Magnetism (with lab)
- Courses planned for Spring 2019 are:
    - 112: Fundamentals of Physics II
    - 220: Mechanics
    - 360: Optics (with lab)

University of British Columbia – Okanagan

Jake Bobowski	University of British Columbia-Okanagan	jake.bobowski@ubc.ca

Information added at the meeting

- Enrollment in all first-year physic courses was up about 7% this year.
- Life sciences based course is using a custom version of calculus based Knight for the textbook
- Jake Bobowski is new articulation representative – Murray Neumann is retiring.
- Murray's position will be filled with a computational Physicist. Also need to fill a medical Physics position.
- First-year numbers up 7%.
- Note again that life-science Physics course is also Calculus-based. Wanted to place life-science and Physical science courses on the same footing. 60% of Physics students take life-science stream.
- Changes to BSc. Degree happening – see report for details.

UBC OKANAGAN

The UBC Okanagan Physics group continues to grow. We have hired a halftime physics technician Jordan Andrews to work with our existing fulltime physics lab manager Hiroko Nakahara. Together, Jordan and Hiroko ensure that the first- and second-year teaching labs run smoothly. We are the in the process of hiring a medical physicist and a computational physicist. We hope to have these positions filled before the end of the summer.

We saw a 7% growth in the number of students taking first-year physics compared to last year. Over the past three academic years, the enrollment numbers in term 1

have been 632, 694, and 744. The corresponding term 2 numbers are 493, 535, and 571. The attrition from term 1 to term 2 is steady at 22 or 23%.

At UBC Okanagan, we offer two streams of first-year physics. The PHYS 111/121 stream in for students interested in the physical sciences and the PHYS 112/122 stream is intended for students planning to enter programs within the life sciences. Both streams are calculus-based. In both terms 1 and 2, about 61% of our first-year physics students were in the life-sciences stream. In both streams, students that have not completed grade 12 physics are required to enroll in a tutorial section.

The average enrollment in second-year courses was 41 compared to 39 last year and 29 the year before last. The average number of students in our upper-year courses was 17. This year, 15 of our students have applied to graduate.

Proposed changes to the Bachelor of Science degree requirements (approved by faculty council) will have an affect on future first-year physics enrollment at UBCO. Currently B.Sc. students must complete six credits of first-year physics (typically PHYS 111 and 121 or PHYS 112 and 122). Students are also required to do six credits of first-year chemistry. In the proposed changes, students will only be required to complete "at least three credits of experimental science in any of CHEM, BIO or PHYS courses with labs." In fact, I believe that Earth and Environmental Science courses with a lab section will also be added to that list.

Therefore, B.Sc. graduates will no longer be required to take any university physics. In fact, it is possible for a student to be admitted to UBC Okanagan's Science program having never even taken any high school physics. (The Physics 11 requirement "may be waived with scores of 86% or higher in senior-level Math and Chemistry".)

Sincerely,

Jake Bobowski
jake.bobowski@ubc.ca

University of British Columbia – Vancouver

Tom Mattison	University of British Columbia-Vancouver	Mattison@physics.ubc.ca

Information added at the meeting

- UBC has capped international enrolment.
- Breadth requirements have changed
- Computing science is no longer accepting the physics computing course as a computing science course, similar problem with biology and statistics. Physics can no longer teach a Computer Science course that counts for Computer Science, it will only count in the Physics major.
- One cohort of engineering at UBC has no BC PHYS 12 as a prerequisite. They are looking at the success rate of this. People transferring in may need to take some additional Science courses. .

UBC-Vancouver Physics & Astronomy Articulation Committee Report

Tom Mattison April 30, 2019

There are currently 130 students in Physics or Astronomy degree programs in 4th year (or above), compared to 125 (2018), 94 (2017), 92 (2016), 69 (2015), 93 (2014), 93 (2013), and 79 (2012). They are: 62 majors physics or astronomy, 16 honours biophysics, 14 combined-honours physics, 21 honours physics or astronomy, 1 combined major oceanography & physics, and 16 combined-major physics & computer science.

There are 83 students (23 of them female) who have applied to graduate this year (52 majors, 31 honours), compared to 70 (2018), 56 (2017), 59 (2016), 46 (2015), 70 (2014), 57 (2013), and 49 (2012). We also graduate about 50 students in engineering-physics each year.

It is difficult to extract the average time students spend getting a degree from the registration system. If half of the students graduate in 4 years and the other half in

5 years, the number of 4th year and above students would be 50% greater than the number graduating each year, which is about what we observe on average.
The second-year lab course PHYS 219, which is required for both majors and honours in both physics and astronomy, and is taken by very few other students, is a good measure of students intending to get a physics degree, and retention of them. Students in 4th year now took it in 2017. Enrollment this year was 102, vs 106 (2018), 101 (2017), 131 (2016), 92 (2015), 99 (2014), and 76 (2013).

We have about 850 engineering students in PHYS 170, 157, and 158. Engineering has increased their enrollment from the previous roughly 800 by the creation of a biomedical engineering specialization. The lab course PHYS 159 still has about 800 students, because the biomedical engineers take a different lab course not taught by Physics & Astronomy.

PHYS 101 enrollment was 1487, compared to 1423 last year, 1416 in 2017, 1353 in 2016 and 1671 (in 2015, before PHYS 117 was created). The vast majority of these are life-science students.

The enriched PHYS 107 (mechanics) enrollment was 96 this year, vs 88 (2018), 98 (2017), 95 (2016), and 99 (2015). PHYS 108 (E&M) enrollment was 70 this year, vs 83 (2018), 94 (2017), 83 (2016), and 77 (2015).

PHYS 117 (mechanics for physical sciences) enrollment was 281, vs 267 (2018), 291 (2017) and 229 (2016). PHYS 118 (E&M) enrollment was 309, vs 315 (2018), 379 (2017) , 427 (2016) and 532 (as PHYS 102 in 2015). PHYS 119 (lab) enrollment was 212, vs 224 (2018), 236 (2017) and 228 (2016).

In the “Vantage College” program for foreign students needing extra help with English language, PHYS 117V enrollment was 154, vs 96 (2018), 102 (2017), 83 (2016), 102 (as PHYS 107V in 2015). Enrollment in PHYS 119V was 88, compared to 41 (2018), 62 (2017), 76 (2016), 86 (as PHYS 109V in 2015).

Enrollment in ASTR 310 for Arts students was 65, compared to 99 (2018), 110 (2017), 143 (2016), 97 (2015), 106 (2014), 184 (2013). Enrollment in ASTR 311 was 42 compared to 63 (2018), 70 (2017), 61 (2016), 55 (2015), 97 (2014), 146 (2013). We had 83 additional students in the distance-education version of ASTR 311, compared to 76 (2018), 81 (2017) and 32 (2016).

Tom Mattison. UBC Vancouver

University of the Fraser Valley

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Peter Mulhern	University of the Fraser Valley	Peter.Mulhern@ufv.ca

Information added at the meeting

- Currently about 20% of students are International Students. A cap is being considered.
- Numbers are stable

University of the Fraser Valley Articulation Report - May 2019

News:

- 1st calculus-based engineering & physics stream courses (PHYS 111/112) enrolments are down a bit (from 291 to 267 on an annual basis), while algebra-based service courses (ASTR 103/104, PHYS 100/101/105) are up a bit (from 194 to 226), so overall pretty stable this year. But calculus-based enrolments are far below our historical high of around 400.
- Second (from 98 to 78 in total) and higher years (from 173 to 141) enrolments are down, but since many of those students are doing the Engineering Physics Diploma as well (see next bullet), these are also pretty stable.
- Engineering Transfer enrolments way down (from 134 to 91), but our Engineering Physics/Mechatronics Diploma enrolments way up (from 33 to 134).
- We have a total of sixteen graduates so far this year – 1 Honours, 13 Majors, 1 Minors and 1 Double Majors. The last two categories are almost always paired with Math. (Other Minors grads may come forward later.)

- We have seven Engineering Physics/Mechatronics Diploma graduates (almost always paired with a Physics Major).
- No progress on our Engineering program proposal. Our experts got hijacked to do a Digital Manufacturing diploma instead, because of the need for immediate STEM FTE proposals to the Ministry.
- International students now approaching 20% of total FTEs at UFV, mostly in CompSci and Business. I estimate the number to be below 10% in Physics.

Changes:

- All first-year service courses now use an OpenStax text. Our calculus-based courses do not, and judging from the poorer performance generated by not having a physical textbook, we are in no rush to change that.
- We plan to introduce Astr 101 this fall, a "lab-less" Astr 103 (History & Solar System). These students and the 103s will have a common lecture.

There is increasing opportunity and encouragement to include learning outcomes relevant to indigenous people in all our courses. Any assistance would be appreciated.

Norm Taylor

University of Northern British Columbia

George Jones	University of Northern British Columbia	George.jones@unbc.ca

Information added at the meeting

- Numbers about the sam
- Small drop in enrolment, large increase in general astronomy. Future for physics leaders not offered this past year. Likely hiring two tenure-track positions over next two years.
- Chance for two instructor positions next year

University of Northern British Columbia Physics Department 2019

UNBC offers a full physics program, and no major curriculum changes were made during 2018/2019.

In January 2018, it was announced that the University of Northern British Columbia will get full programs in both civil and environmental engineering. Each program will have 35 seats in each year. This should increase enrollment in first-year calculus-based lectures and labs (more sections) by 35 students, starting in Fall 2019.

In 2016/17, OpenStax was used for the first time in the physics 12 equivalency course, and in 2017/2018 OpenStax was used for the first time in Astronomy. Overall verdict: good, but not quite as polished as "traditional" texts. In 2018-2019, both courses changed instructors and moved back to "traditional" texts. The UNBC Astronomy instructor who used OpenStax, Erik Jensen, has a detailed review on the bccampus.ca website, https://open.bccampus.ca/find-open-textbooks/?uuid=aa7e4991-20af-489b-8fb1-fdbe155b9702

Enrolment

	2015-2016	2016-2017	2017-2018	2018-2019	% change
Physics 115 (physics 12)	61	68	74	71	-4
Physics 110/111 (calculus-based)	149	131	134	122	-9
Physics 100/101 (algebra-based)	156	172	200	189	-6
ASTR 120/121 (Astronomy)	32	39	37	57	+54
Physics 150 (Physics for Future Leaders)	26	10	10	not offered	
Second-Year (four-course total)	18	32	30	40	+33

Textbooks

	2016-2017	2017-2018	2018-2019
Physics 115 (physics 12)	*College Physics*: OpenStax	*College Physics*: OpenStax	*Physics*, Cutnell and Johnson
Physics 110/111 (calculus-based)	*Physics for Scientists and Engineers*, Serway and Jewett	*Physics for Scientists and Engineers*, Serway and Jewett	*Physics for Scientists and Engineers*, Serway and Jewett
Physics 100/101 (algebra-based)	*College Physics*, Serway and Vuille	*College Physics*, Serway and Vuille	*College Physics*, Serway and Vuille
ASTR 120/121 (Astronomy)	*Astronomy Today*, Chaisson and McMillan	*Astronomy*, OpenStax	*Astronomy Today*, Chaisson and McMillan
Physics 150 (Physics for Future Leaders)	*Physics and Technology for Future Presidents*, Muller	*Physics and Technology for Future Presidents*, Muller	not offered

George Jones
Department of Physics, University of Northern British Columbia

University of Victoria

Mark Laidlaw	University of Victoria	laidlaw@uvic.ca

Information added at the meeting

- Numbers about the same. Algebra based numbers up, calculus down a little due to fewer ENGR students
- Textbooks are open = custom made by U. Vic. Professors
- Proposal to remove physics 12 as an admissions requirement as a pre-requisite for engineering
- About six years ago U Vic physics stopped requiring BC PHYS 12 as a pre-requisite for their physics courses. Recommended but not required. Enforce the calculus co-requisite. The success rate has stayed the same.
- International students "Strategic Enrolment Management Framework" at about 18% where it is now. Might be capped at 18%.

UVic 1st and 2nd year PHYS and ASTR articulation report, May 2019

1st year PHYS:

There were no significant changes in our offerings this past year.
Our overall enrolment was approximately stable, but the mix between calculus-based and algebra-based changed with an increase in proportion of students taking the algebra-based course. This year there was an increase in the Science intake, and less students than usual entered Engineering.

- Effective 2017/18 we split PHYS 102 into PHYS 102A and 102B. This year we offered two sections of 102B in January instead of three. The transfer guide system was updated so courses that combined to be PHYS 102 now, together, go to PHYS 102A and 102B.
- Effective September 2017 are using UVic's Moodle-based platform for online assignment. Completion rates are similar to those we had before.

- Effective January 2019 we are using UVic-written texts for both PHYS 110 and 111. The cost to student is about half that of a publisher's text. Royalty revenue is going to improvements in our senior teaching labs

Courses offered:

PHYS 102A (first term) and 102B (second term) – An algebra-based survey of physics.
Normally offered Sept-April. *Formerly a two-term course PHYS 102.*
Primary Audience: Biology students
Text: Serway (algebra based, latest edition)
Enrolment: Initially around 500.
Final enrolment PHYS 102A:
Fall 2018: 519 ('17: 473)
Final enrolment PHYS 102B:
Spring 2019: 377 ('18: 330)
End of term PHYS 102 enrolments: '17- 410 '16- 413, '15- 446, '14- 399, '13- 436
Topics: Mechanics and energetics, oscillatory and wave motion, fluids, thermodynamics, electricity and magnetism, optics, modern physics

PHYS 110 (first term) and 111 (second term) – A calculus-based survey of physics
PHYS 110 offered Fall (Sept) and Spring (Jan)
PHYS 111 offered Spring (Jan) and Summer (May)
Primary Audience: Natural Science and Engineering students
Text: UVic locally-written text and supplements.
Enrolment: Initial (fall) enrolment peaks at 750-800
Final enrolment PHYS 110:
Fall 2018: 498 ('17: 556, '16: 599, '15: 606, '14: 609, '13: 566)
Spring 2019: 144 ('18: 156, '17: 162, '16: 154, '15 159, '14: 134)
Final enrolment PHYS 111:
Spring 2019: 420 ('18: 490, '17: 448, '16: 460, '15: 473, '14: 435)
Summer 2019: 89 ('18: 77, '17: 71, '16: 84, '15: 87, '14: 73)
Topics: As for 102, with limited content on fluids and electromagnetism
110 – Mechanics, conservation laws, electric and magnetic forces
111 – Thermodynamics, oscillatory and wave motion, optics, modern physics

PHYS 120 (first term) and 130 (second term) – Physics for Physicists and Astronomers
Normally offered Fall (120) and Spring (130)
Primary Audience: Prospective major/honours students
Text: Young and Freedman – University Physics with Modern Physics (latest edition)
Enrollment: Used to peak near 100
Final enrolment 120: 62, ('17: 57, '16: 74, '15: 88, '14: 104, '13: 106, '12: 116)
Final enrolment 130: 48 ('18: 42, '17: 49, '16: 58, '15: 68, '14: 72, '13: 66)
Topics: As for 102 omitting Electricity and Magnetism and Thermodynamics
120 – mechanics and special relativity
130 – rotational motion, oscillatory motion, waves, modern physics

2nd year PHYS:

The University of Victoria offers a number of second year Physics courses, four of which are common to all our undergraduate programs. Enrollment have been relatively stable for the past years.

Three significant changes came to our programs effective fall 2017:

- Introduced an experimental physics course PHYS 229. This course replaced a laboratory electronics course PHYS 214 in all programs.
- Thermodynamics was moved to 3rd year and renumbered as PHYS 317 (from 217). Students who have credit (e.g. via transfer) for PHYS 217 are exempted from the named-course requirement for 317, but must satisfy UVic's rules about number of senior courses.
- New 2nd year course numbered PHYS 248 offered in partnership with MATH. The course title is *Computer Assisted Mathematics and Physics.*

Courses offered:

PHYS 210 (also EOS 210) – Geophysics

Normally offered in the fall.
Primary Audience: PHYS/EOS combined program students
Text: Selections from several books, including Lillie – Whole Earth Geophysics
Enrolment: About 60 (20 as PHYS, 40 as EOS).

Enrolment: 2018: 56 ('17: 62, '16: 32, '15: 51, '14: 54, '13: 46, '12: 46, '11: 41)

PHYS 215 – Introductory Quantum Physics

Normally offered in the spring.
Primary Audience: PHYS and ASTR major and honours students
Text: Varies depending on instructor, usually Thornton and Rex
Enrolment-Spring: 2019: 57 ('18: 49, '17: 42, '16: 46, '15: 35, '14: 32, '13: 48, '12: 44)

PHYS 216 – Introductory Electricity and Magnetism

Normally offered in the fall – offered again this summer in compressed form.
Primary Audience: PHYS and ASTR major and honours students, and Engineers
Text: Excerpts from Young and Freedman – we are looking for a better text.
Enrolment: 2018: 75 ('17: 72, '16: 64, '15: 67, '14: 53, '13: 54, '12: 61, '11: 53)

PHYS 248 – Computer Programming in Math and Physics

Normally offered in the spring. Offered as a "trial" in 2015 and 2016.
Required in MATH effective 2016/17 year.
Required in PHYS effective 2017/18 year.
Primary Audience: PHYS, ASTR, and MATH major and honours students
Text: None standardized
This course has had "growing pains" as the enrolment has gone from ~30 to ~90 in three years. There are also challenges associated with the diverse backgrounds of the enrolled students.

Enrolment	Spring	PHYS	MATH
	2019	57	38
	2018	32	24

2017	5	22
2016	10	n/a
2015	7	n/a

1st year ASTR:

The University of Victoria offers three 1st year Astronomy courses, two intended for non-majors and one that is the first course in our ASTR progression.
The number of sections of ASTR 101 and 102 offered has changed in response to the 2017 retirement of a long-serving staff member.

Courses offered:

ASTR 101 and 102 – Astronomy for non-specialists (101-Solar System, 102-Cosmology/Stars)
Primary Audience: General interest
Text: Varies depending on instructor
Enrolment: About 150-180/term in ASTR 101; About 100-120/term in ASTR 102.
Summer offering about 60-80.

ASTR 150 – Concepts in Astronomy
Primary Audience: Astronomy major/honours students
Text: Varies depending on instructor
Normally offered in the spring.
Enrollment: 2019: 62 (‘18: 50, ‘17: 61, ’16: 72, ‘15: 83, ‘14: 67, ‘13: 55, ‘12: 45)

2nd year ASTR:

The University of Victoria offers three second-year Astronomy courses, one intended for general interest, and two that form part of our ASTR program. ASTR 201 is a recently developed course.

Courses offered:

ASTR 201 – Search for Life in the Universe
Primary Audience: General interest
Text: Readings
Enrolment: 50-70.
Normally offered in the fall.

ASTR 250 – Introductory Astrophysics
Primary Audience: ASTR major/honours students
Text: Freedman and Kaufman - Universe
Enrolment: 2018: 30 (‘17: 27, ‘16: 24, ’15: 33, ‘14: 24, ‘13: 30, ‘12: 21, ‘11: 20)
Normally offered in the fall.

ASTR 255 – Planetary Science

Primary Audience: ASTR major/honours students
Text: Varies depending on instructor
Enrollment: 2019: 18 (‘18: 9, ‘17: 15, ’16: 11, ‘15: 10, ‘14: 11, ‘13: 16, ‘12: 10)
Normally offered in the spring.
This course has been taught for several years by adjunct faculty whose primary affiliation was HIA (DAO). A new faculty member specializing in exoplanets has been hired, and there may be changes to this course reflecting his research interest.

Vancouver Community College

Aydan Bekirov	Vancouver Community College	abekirov@vcc.ca

Information provided at the meeting

- Numbers about the same.
- Declining enrolment in Phys11, Phys12.

Report to UT Physics and Astronomy Articulation 2019
Vancouver Community College

As mentioned two years ago, Mechanics 1 (PHYS 1170) has been added to the engineering certificate at VCC. This course transfers to UBC as PHYS 170. We attempted to run a section of this course in May 2017, but it was cancelled due to low enrollment. We offered it again in May 2018 with 10 registered students. The same course will be offered May-June 2019. So far enrolment is good, and it looks like it will run. Winter 2020, we will be offering in class and online sections of PHYS1170.

We ran one section of the first half of our calculus-based 1st year physics (PHYS 1100) in winter 2018 which had strong enrolment. In fall 2018 we ran one section of the second half (PHYS 1200) also with strong enrolment.

2020, we may offer new algebra-based course “Physics for Health Sciences”, which is dedicated to VCC health science faculty students.

Dr. Aydan Bekirov (Dr B) Physics Instructor Vancouver Community College
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Vancouver Island University

Brian Dick	Vancouver Island University	Brian.Dick@viu.ca

Information added at the meeting

- Numbers about the same with calculus based students are down and algebra based up.
- Seeing increased applications for Engineering now.

VANCOUVER ISLAND UNIVERSITY

Vancouver Island University report to the Physics Articulation Meeting 2019

1. Student numbers trends differed within the calculus-based and life science streams. The Life Science stream has returned to 2017/18 levels after a dip last year - P111/P112 numbered 83/51 this year and 74/42 last year. The Calculus-based courses, however, continue their downward trend - P121/P122 numbered 57/43 this year and 63/48 last year. As reported previously, the calculus-based physics enrolment is strongly dependent on engineering enrolment, which continues to fall compared to the previous year (albeit reportedly consistent with demographic trends in high school graduation rates for this region).
2. Astronomy continues to run two 1st year (solar system, stars & galaxies) & two 3rd year (cosmology, history). The 3rd year courses continue to remain well (over) subscribed, and first-year enrolment continues to be strong (total enrolment within the four ASTR courses: this year 126; last year 103). Numerous astronomical viewing sessions (e.g. Super Blood Wolf Moon eclipse) have taken place for both students and the broader community using the department's telescopes (weather permitting of course).
3. As reported last year, the SCIE 350 (Technologies for the Developing World) was cancelled despite increasing enrolment in the course. It has remained a challenge to find support for courses with the department that are not listed explicitly as program requirements, despite whatever student interest and interdisciplinary focus they may have.

Yukon College soon to be Yukon University

Jaclyn Semple	Yukon College	jsemple@yukoncollege.yk.ca

Information added at the meeting

- Becoming Yukon University in Spring 2020. Hybrid university – see report.
- New Science building in the works.
- Hoping for an Astronomy course in the Winter and hoping to use OpenStax textbook. Would like to hear your thoughts on this.

Yukon College Articulation Report May 2019

Acknowledging that we live and work in the traditional territory of the Kwanlin Dün First Nation and the Ta'an Kwäch'än Council.

https://www.yukoncollege.yk.ca/
500 College Drive, PO Box 2799 Whitehorse, Yukon Y1A 5K4
(867) 668-8800 or 1-800-661-0504

The college has received CAQC approval to become Yukon University as well as approval for our first made-in-Yukon degree in Indigenous Governance. http://yukonuniversity.ca/yukonu Yukon College will become Yukon University (YukonU) in spring 2020. It's been a long journey and now we're ready! Yukon University will be a hybrid university – a flexible, post-secondary institution that includes a place and a pathway for every learner. We will provide greater opportunities for students to be grounded in research and education relevant to the North. Our thirteen campuses will continue to play a critical role in delivering education to the communities of the Yukon, while inviting students from across Canada and internationally to come study with us and learn more about Canada's north.