Physics and Astronomy Articulation Minutes with Reports May $5\ 2023 - V2$

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Attendance Record

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		University	

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	Laidlaw	of Victoria	

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In	Andy	Vancouver	<u>asellwood@vcc.ca</u>
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person		Island	
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Omme	Chapoll	501	benapene douglaseonegelea
	Chapen,		Deen of Science and Technology
			Dean of Science and Technology,
			Douglas College and BCCAT
			System Liaison Person (SLP)
Online	James	UBC	<u>charbonneau@science.ubc.ca</u>
	Charbonea	Associate	Associate Dean - Students,
	u	Dean of	Faculty of Science
		Students,	Associate Professor of Teaching,
		Faculty of	Physics and Astronomy
		Science	http://www.phas.ubc.ca/~james
			4
In	Vanessa	Coast	Administrative Assistant with Student
person	Greening	Mountain	Success

Physics and Astronomy Articulation Minutes

This was a Hybrid meeting via Blue Jeans and in person at Coast Mountain College in Terrace, BC. 13 people in person and 28 online. The meeting began at 930 am and finished at 330 pm.

1 We began this meeting by respectfully recognizing we are gathered today on First Nation's traditional unceded territory. We were welcomed by a local Elder David Wells and the Dean of CMTN Kara Loy. Regan Sibbald

	read an acknowledgement of the unceded land on which we were
	gathered.
2	Welcome by Dean Kara Loy.
3	Everyone introduced themselves, both in person and virtual.
4	Agenda was approved unanimously by consensus.
5	Minutes were approved unanimously by consensus. You can visit the
	BCCAT web page to view these and other past minutes.
	https://www.bccat.ca/articulation/committees/phys-astr
6	Actions arising from the minutes
	1) BCCAT Jennifer Kook mentioned that there is an automatic review
	of courses that have been in the system for 10 years, but it just
	started recently so last year there was a large number of them so
	there will be fewer going forward.
	2) BCCAT has a Moodle site for all articulation committees. Jennifer
	Kirkey, the current but soon to be past chair, committed to help the
	new chair to set up the physics one to post past minutes and
	exams, etc.
7	There was a review of courses in the system that are still waiting
	transfer. There was a large number as many institutions had just put
	their requests in. For the few that are nearing one year, chairs were
	encouraged to contact their Registrar and to check the BCCAT site.
8	BCCAT SLP (System Liaison Person) report. Brian Chapell is Dean of
	Science and Tech at Douglas College and has been our SLP for three
	years. <u>chapelld@douglascollege.ca/</u>
	• The Provincial Government launched a funding review of Post-
	Secondary Education starting last year. They have a new Digital
	Learning Strategy but Brian was not able to share any more
	details. Keep an eye on this.
	https://www.2.gov.ha.co/gov./goptont/advantion_training/post
	<u>interps://www2.gov.bc.ca/gov/content/education-training/post-</u>
	secondary-education/institution-resources-administration/digitar-
	<u>lear mig-strategy</u>
	• He thanked Jennifer Kirkey for her years of service as chair.
	• BC Deans of Arts and Science Programs (BCDASP) is a
	committee that meets twice a year to discuss system wide
	concerns They recommitted their a support for Open Educational
	Resources (OFR) Look at last year's minutes to see the official
	statement
	אמנכוווכוונ.

	• Indigenization and EDI (Equity, Diversity and Inclusion) continue to important.
	• Old transfer agreements are being reviewed some are decades old, so he urged committee members to take a look at the agreements.
9	Institutional reports. Members were invited to share a few highlights or additions to the written reports that have been circulated electronically before this meeting. 2 minutes per institution. See the attached reports for the original report and any information added.
1	Advice given to students entering UBC who do not yet have calculus.
0	There is a math streaming questionnaire that students do at UBC that is unnecessarily negative in the opinion of many articulation members.
	https://www.math.ubc.ca/undergraduate/advising-and-resources/first-year-calculus-options.
	The question was why can't a student admitted to Arts, who didn't take much High School math, not take enough math at UBC to get to calculus? Tom Mattison and James Charbonneau will look into this. This started due to many Articulation Members expressing concern about a noticeable decrease in the math ability of students since Covid-19, but incoming high school grades still being high. Please note that many students from many institutions to take a course through Open Learning at TRU.
1 1	 James Charbonneau, Associate Dean - Students, Faculty of Science and Associate Professor of Teaching, Physics and Astronomy, UBC Vancouver joined us online to talk about his role as Associate Dean of Students. He interacts with articulation in his new job in many ways, in particular in his role as an academic advisor. Faculty of science has 10,000 students and about 1500 are transfer students and half of those are domestic students most from BC. The information system is being upgraded / changed to WorkDay. 400 people have been hired to do this transition and concerns are being raised that it will not be a smooth transition. Articulation members might want to warn their students. About 50 students are part of a Global Exchange where students do a minimum of one semester, sometimes a full year, to go to another institution that need to be articulated. This is challenging

		but the students find it very worthwhile.
	•	He is involved with a field course and other experiential learning
		opportunities with rewards and challenges. About 50 students a
		year ask for unusual courses such as https://biomatravel.org/.
		UBC faculty members are associated with this course and
		encourage students to take it so they want it to come with
		academic credit. Sea turtle research but it is not offered by a
		university thought I deserves and has been granted IIBC fourth
		vear biology XXXX (unassigned) credit. It is outside the usual for
		IIBC Science There is a Sea Turtle Field course
		(https://hiomatravel.org) that I have worked on to get students
		(<u>inteps.//bioinatravel.org</u>) that i have worked on to get students crodit for The challenge is there is no formal registration so how
		cap students get student leans? It does not count towards the
		dagnee. The students are years herey with this. This is a private
		degree. The students are very happy with this. This is a private
		company who is funding this. The students pay for it all – the
		plane ticket, housing, etc. Really promoted by the faculty
		members in biology so the Office had to deal with the credits.
		James used to teach Science One so is somewhat used to more
		general courses.
4		
1	•	Bccampus Open Source course and materials for Engineering
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	•	https://commons.wikimedia.org/wiki/Category:OER Images by
		University of Saskatchewan Engineering
	•	2000 WeBWork problems can be found on Git Hub at
		https://github.com/ubc-mech2/OER-mechanics-
		webwork/tree/master/OER%20Mechanics%20WeBWorK%20Cu
		<u>rrent%20Problems</u> Hopefully the problems will be in the Open
		Problem Library but an administrative step that is beyond our
		control is holding that up.
	•	The textbook and open source materials were used last year both
		at Douglas College and UBC.
1	Chap	GTP discussion
3		
	•	The European Network for Academic Integrity (ENAI)
		Recommendations on the Ethical Use of Artificial Intelligence has
		just been published in the International Journal for Educational
		Integrity.
		https://edintegrity.biomedcentral.com/articles/10.1007/s40979
		<u>-023-00133-4</u>
	•	Interesting article on AI and the FCI.
		https://arxiv.org/abs/2303.01067
	•	There are no formal statements yet on AI from college or
		university administration, though it is a hot topic of debate. Brian
		Chapell our SLP said that at the Dean meeting, three weeks ago, no
		one has an official policy yet to the best of his knowledge. And
		the Deans also talked about the calculators, but the scope is so
		much greater that it is more than calculators. Shared the anecdote
		about his Grade 11 child and will have an impact on incoming
		students where it is already a verb "I just ChatGPTed my English
		assignment and I got an A on it".
	•	Discussion about how this was shades of the calculator debate.
		Can it be used as a tool? Interesting debate about its use versus
		academic freedom.
	•	Regan Sibbald from Coast Mountain College, our gracious host,
		mentioned that a number of his non science colleagues are
		concerned but in terms of physics assessment as he always does
		face to face assessment of their work – tests and labs. If we really
		want to assess, face to face exams appear the best way to go.
	•	Kelly Cheung from Alexander College shared that the effect is on

	 projects done outside the classroom. Ben Tippett COTR used to do a final project in the Astronomy course as opposed to a final exam, but he cut it out due to ChatGPT. Students are cheating because they do not think our courses are valuable. If we can make it clearer to them that what we do is valuable, relevant, it will help. Authentic assessment is the key here. What cannot be Googled. Jennifer shared Tony Bates's comment. Its evolution is very scary. It will get better very quickly. Tony Bates is an Education Professor from UBC whose book on Digital Learning is a standard. Well worth a read. https://www.tonybates.ca/2023/01/02/playing-with-chatgpt-now-im-scared/ Arnold from TWU said he has tried putting the FCI through it and will have the students explain the problems in the answer. Proof that ChapGPT is wrong, a lot. Will we change our course learning outcomes because of AI? Maybe just make the oral part of an exam pass-fail to filter out the AI-dependent students? More practical based exams likely in the future. Learning activities, in particular experiential learning activities such as laboratories, are different from assessment. Note that relying on Chapt GPT doing badly, is not a good idea as it will get better, and it already has. ChatGPT 4 is out. Chris Avis also said "how do we keep our jobs" in the future. We need to change how to assess. WE need to help them to use this tool. Tom Mattison from UBC stated that the majority of our students will not need to solve physics problems after the leave our schools, but it is the thought process, not necessarily the physics problems. Physics is all about critical thinking and analysis, examining truth. So we might be a the forefront. Questioning to help prevent GIGO.
1	How much difference is there between algebra and calculus-based intro
4	physics courses at institutions across BC?
	 Douglas College said that the biggest difference are an emphasis on 3D with ijk notation and 3D with deeper understanding. Integrating calculus throughout.

r	1
	• CMTN – Algebra stream is more of a survey. Broader. More optics in the algebra-based course. More topics so less depth. While the depth and complexity is really really different.
	 Capilano said they just added an algebra stream a few years ago
	Started very similar. More calculus explicitly.
	• In the lab – CMC – we video conference we have labs that do both.
	So the labs are the same set up, but the analysis is different. Higher
	level expected. Differential error analysis for the calculus based.
	Updating our courses. They have to figure out the equation.
	 Douglas - Data analysis – error bars, non-linear analysis, higher expectations for the calculus students.
	• UFV – the labs are exactly the same for algebra and calculus for the
	first semester mechanics. Second semester optics and electricity
	and magnetism are different. The calculus labs target e and m so
	the algebra/biology stream are more of a survey with optics-
	circuits-waves-thermo. This is due to UFV biology course
	requirements.
	 KPU – no difference in the labs for the two streams
	 At UBC-V, really only engineers and physics majors are REQUIRED
	to take the second semester (E&M). Other science specializations are actually allowed to not require even one physics course,
	altilough they all uo at this point.
	• 0 VIC - UNITERITY A MISTAKE FOR US AS A discipline to do an E&M
	course while they re only learning single-variable calculus.
	 Douglas – more dense as there are more topics and going more deeply into the analysis.
	• We need to convince the math people to get to more of the useful
	math earlier. Sticking to polynomial functions and trig and to
	hammer on the "area under the curve" way to solve, which is
	actually calculus. This is the same as Douglas.
	Discussion of Engineering Mechanics courses (PHYS 202 at Okanagan
5	Lonege's PHYS 202J, including now many nours per week, and the
	Dieakuowii between iettui e, seminar, and tutorial nours. This is DHVS170 at HPC and DHVSIII in the Common Core
	Douglas does 4 hours.
	 CMTN does 3 hours a week and does thermos in PHYSI.

	 Many answers in chat with the average being 4 hours.
	• UFV this is PHYS 221 – three lecture at 1.5 hours
1 6	 Discussion about Classical Mechanics courses (PHYS 228 at Okanagan College). Context: it's been many years since we last taught this course, and we will be teaching it again in Winter 2025 to make our second year course selection more complete. It would be good to see more about how other institutions offer this course, including recent syllabi. Douglas - we are in the process of updating the course outline. We are interested in the pre-reqs for the course at other institutions. We closely model SFU.s course. Calculus II and the first semester of calculus-based physics is the common pre-req. Would like advice on the newish books. Ben Tippet from COTR - the book goes quickly into Langrangian mechanics and that is too high. Intro to Classical Mechanics by Morri; Engineering Mechanics by Merriam & Kraige; Marion & Thornton; Fowles & Cassidy Ben Tippett used the Feynman lectures + some other chapters from Open Stax University Physics. Struggled to find the right level. There is a book that has supplemental questions for Feynman. UBC-V Phys 216: Merriam and Kraige: Engineering Mechanics: Dynamics. When I did it many years ago, we used later chapters from Hibbeler (that were also used in PHYS 270 for engineers)
	Final exam weight
	• Okanagan College has been reducing the weight of the final exam for our intro physics courses over the years, and we'd like to see what other institutions are doing in this regard.
	• UBC – folks are concerned about grade inflation are concerned and like relatively high weights for mid terms and the final exam. 48% on final and 17% and 17% on the two tests. No makeup midterms, all pushed to the final so it could be as high as 82% but education research people say that exams should be less. UBC does not have a consensus. James Charbonneau made one change to the rules that allows that an instructor can make any one element essential

	 to pass a course. This is common for most of the first year math-science courses at UBC. Yes, in almost all science courses where labs are attached, student have to pass the lab to pass the course. KPU – Michael – I like to keep individual assessment about 75%. Douglas – 20% lab and 10% other so about 70% on assessments. Most have a rule to pass the final you must pass the course. Less than 50% but we do not tell them in advance. UFV – does not have this as a requirement. No official policy on this or how much the final exam is worth. Do have the requirement to pass the labs to pass the course. Camosun College – labs are a problem as only worth 20% so making it essential to pass the course you have to pass the lab puts too much weight and violates college policy. At Douglas College you have to write such rules such as " pass the lab or pass the final exam to pass the course" into the curriculum guideline it is taken as an exception to the college policy. Curriculum guidelines go through Education Council so once passed there they are allowed as an exception. Peter smith at Fraser International College has an attendance policy and they must pass all the major assessments. This is an international college, so they have to do it. They are allowed to do make up labs. CapU: Must pass the lab to pass the course. From my understanding this was a general policy that was pushed for from the Chemistry department due to safety concerns. Ben from COTR - final exam is the biggest chunk of the course, and worth even more if they do better on the final exam then on the midterms.
	Should all first year physics lab students learn LaTeX was the question
	but virtually everyone said no.
	• KPU does it in second year. The format of the LaTeX reports are beautiful, but the words the students put into their reports are not beautiful. They give the students a template for the report.
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	• UBC said that 15 years ago we pushed LaTeX but then in second					
	year and not even in second year anymore.					
	 UFV – are allowed the freedom to choose which program to 					
	produce the reports, but LaTeX is preferred By the end of the					
	semester, all are using LaTeX.					
	• If ChatGPT can write code, build websites, etc. It will absolutely be					
	able to write in LaTeX. At this point, our first year courses are so					
	crowded with content, I am very reluctant to add in anything else					
	that can be easily replicated with emergent technology.					
1	Location for Friday May 3 2024 meeting is Langara College in Vancouver					
7	for both engineering and physics articulation.					
	Friday 2 May 2 2025 will be in Prince George again after "only" 7 years.					
	Engineering at UBC on the Thursday and CNC College of New Caledonia					
	for Physics on the Friday. There was some discussion about moving the					
	meeting one week later and the semesters end later and later but					
	concerns were raised by the chair and the SLP about changing the matrix					
	for the meeting. Jennifer commits the new chair to looking into changing					
	the date, but as of now we will stick with the first Friday in May as usual.					
1	Chair election – Jennifer resigned this year after years of warning as she					
8	wants to help mentor the new chair in the years before she retires. Kelly					
	Cheung from Alexander College was elected unanimously by consensus.					
1	Adjourned at 330 after many thanks you to our gracious hosts and to					
9	Jennifer for her work as chair.					
2	A tour of facilities followed led by Dean Kara Loy. Terrace, and Coast					
0	Mountain College, is beautiful and all are encouraged to visit.					

Regan Sibbald, Jennifer Kook from BCCAT, Andy Sellwood, Michale Poon and Barbara Rudecki in the Meeting Hall at Coast Mountain College.

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List of pending articulation requests as of May 5 2023.

Course	Pending	Expires
	31: CAMO, CAPU, CCC, CNC, COQU, COTR, DOUG, KPU, LANG, VIU, NIC, NVIT, SELK, SFU, TWU, UBCV, TRU, UFV,	Apr 25 2024
OC ASTR 230 (3)	QU, FIC, LC	
OC ASTR 220 (3)	31: CAMO, CAPU, CCC, CNC, COQU, COTR, DOUG, KPU, LANG, VIU, NIC, NVIT, SELK, SFU, TWU, UBCV, TRU, UFV, UNBC, UVIC, VCC, UBCO, UCW, YVU, ASM, ALEX, FDU, AU, QU, FIC, LCV	Apr 25 2024
OC ASTR 122 (3)	29: CAMO, CAPU, CCC, CNC, COQU, COTR, DOUG, KPU, LANG, VIU, NIC, NVIT, SELK, SFU, TWU, TRU, UFV, UVIC, VCC, UBCO, UCW, YVU, ASM, ALEX, FDU, AU, QU, FIC, LCV	Apr 25 2024
OC ASTR 112 (3)	30: CAMO, CAPU, CCC, CNC, COQU, COTR, DOUG, KPU, LANG, VIU, NIC, NVIT, SELK, SFU, TWU, TRU, UFV, UNBC, UVIC, VCC, UBCO, UCW, YVU, ASM, ALEX, FDU, AU, QU, FIC, LCV	Apr 25 2024
UFV ENPH 340 (4)	3: CAPU, KPU, UVIC	Dec 8 2023
UFV ENPH 310 (5)	1: TRU	Dec 8 2023
UFV ENPH 310 (4)	1: TRU	Dec 8 2023
CMTN PHYS 121 (3)	1: VCC	Apr 25 2024
CMTN PHYS 122 (3)	1: VCC	Apr 25 2024
CNC PHYS 110 (3)	27: CAMO, CAPU, COQU, COTR, DOUG, KPU, LANG, VIU, NIC, NLC, NVIT, SELK, SFU, TWU, UBCV, UNBC, UVIC, VCC, UBCO, OC, UCW, YVU, ASM, ALEX, AU, QU, LCV	Apr 24 2024
VCC PHYS 1200 (4)	1: CAMO	Apr 4 2024
VCC PHYS 1200 (4)	7: COTR, LANG, NIC, NLC, SELK, FDU, AU	Apr 4 2024
VCC PHYS 1190 (3)	4: CAMO, CAPU, SELK, FDU	Apr 4 2024
VCC PHYS 1170 (3)	6: CAMO, COQU, DOUG, NLC, SELK, FDU	Apr 4 2024
VCC PHYS 1110 (3)	6: CAMO, CAPU, LANG, NIC, SELK, FDU	Apr 4 2024
VCC PHYS 1100 (4)	7: COTR, LANG, NIC, NLC, SELK, FDU, AU	Apr 4 2024
COTR PHYS 104 (3)	2: CAPU, LANG	Feb 17 2024
COTR PHYS 104 (3)	3: KPU, VIU, UVIC	Feb 17 2024
COTR PHYS 103 (3)	2: CAPU, LANG	Feb 17 2024
COTR PHYS 103 (3)	1: UVIC	Feb 17 2024
OC PHYS 202 (3)	15: CAMO, CAPU, CCC, LANG, VIU, NIC, NVIT, SELK, SFU, UVIC, UBCO, YVU, AU, QU, LCV	Feb 9 2024
OC PHYS 112 (3)	8: CAPU, COTR, JIBC, LANG, NVIT, SELK, UVIC, LCV	Oct 26 2023
SELK PHYS 200 (3)	1: UNBC	Jun 22 2023

Chair Report

It has been an honour and a pleasure to be the chair of this committee for the last several years. I have been doing a countdown to my retirement. I will be retired by September 2026 and I hope to retire in 2025 so it is time for me to step down to help mentor the new chair.

My apologies for the lateness of the agenda and other items related to articulation. I promised to, but did not complete, to start and fill up the Moodle space hosted by BCCAT for this committee, in particular exams from a variety of institutions. This is a project for the upcoming year.

I moved in December and then the Physics Department at Douglas College got hit by a number of medical issues. If anyone tells you that COVID is over, I can assure that it is not. At the end of term, more than half the department was off on medical leave. It was not so much the covering of other physics classes, but having to tutor math faculty to teach physics courses that took up a lot of my time leading to the lateness of this package.

I have been working with BCcampus on developing an Open Course for our PHYS1170 which is PHYS170 at UBC or the PHYSIII Common Core. https://collection.bccampus.ca/ It will be available sometime this summer. I offer you a question from that final exam. During the move my car got ice bombed.

(10 marks) Question Six

At the start of the semester, Jennifer's car was badly damaged when a chunk of ice fell on it. No one was hurt, but insurance company wrote the car off. Calculate the forces involved and plot net force versus time from the time it started to fall until it came to rest. Look at the pictures to see where the following reasonable numbers came from. Assume the chunk of ice that hit the car had a mass of 2.00 kg. It started from rest at the top of the bulding and fell vertically downwards for a distance of 24.0 metres. There there was a constant force of air resistance of 3.00 N while it was falling. Then it hit the windshield. Assume that the forces instantly changed and the ice was brought to rest in a distance of 15.0 cm, undergoing constant acceleration.







The car before the ice fell.





After the ice fell.Outside viewAfter the ice fell.Inside view.Image credits:Jennifer Kirkey (own work)December 26 2022.

While falling.

$$\uparrow + \sum F_y = ma$$
(air resistance force) - (gravity force) = ma
(3.00 N) - (2.00 kg)(9.81 m/s²) = (2.00 kg)a

$$a = \frac{F_{air resistance} - F_{gravity}}{2.00 kg} = \frac{3.00 N - (2.00 kg) (9.81 m/s2)}{2.00 kg} = -8.31 m/s2$$
So a = 8.31 m/s² down
Using the equations of kinematics
 $v_{final}^2 = v_{initial}^2 - (2)(a)(displacement)$
 $v_{final}^2 = 0 - (2)(-8.31 m/s2)(-24.0 m)$
Final velocity = -19.97 m/s = -20.0 m/s
You have to choose the negative root if you defined up as positive or state
down.

$$a = \frac{v_{final} - v_{initial}}{t} \quad so \ t = \frac{v_{final} - v_{initial}}{a} = \frac{-19.97 \frac{m}{s} - 0}{-8.31 \frac{m}{s^2}} = 2.40 \ s$$

During contact with the windshield, slowing down to stop Using the equations of kinematics



Notes: -4 marks if ignored air resistance

-5 marks if did not show a change in the direction of the net force

-8 if assumed a = g for the whole question.

Alexander College

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Information added at the meeting:

- Enrolment has rebounded. Most students are international
- More students at the college but few of those are physics students



Alexander College Physics Articulation Report: May 2023

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. Enrollment has been increasing the past year with 2714 students in Spring 2022, 3224 in Fall 2022, and 4023 in Winter 2023. A large majority of new students are from India.

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. The past term, we offered about 106 different courses with 361 course sections. Students can enroll in two-year Associate degrees in Arts and Science, all of which include laboratory science requirements. In 2022, 416 Associate of Arts and 23 Associate of Arts degrees were conferred which is a decrease of around than 35% from the previous year.

Last year, Alexander College transitioned from classes being 50% taught through Zoom and 50% on-campus to 20% of classes online and 80% of classes on-campus. Since Winter 2022, all physics labs and exams have been run on-campus. This ensures our students get hands-on experience in the labs and prevents academic integrity issues arising from online exams.

The lecture components of our classes can have up to 35 students, and our oncampus physics labs hold a maximum of 18 students to give students the opportunity to work with the concepts actively in class through interactions with the instructor and students. Typically, \sim 40% of students registered in physics courses achieve A or B grades, but the past academic year, only \sim 20% of students achieved grades of A or B.

<u>Physics courses offered the past year and planning to offer the upcoming academic year:</u>

Physics 100: Introduction to Physics (87 students the past year) (Text: Urone and Hinrichs, *College Physics*)

Physics 141-142-143: Engineering Physics I, II, III

I: Mechanics and Modern Physics (18 students the past academic year)

II: Electricity and Magnetism, Optics (not offered the past academic year due to low enrolment)

III: Engineering Mechanics (not offered the past academic year due to low enrolment)

(Text: Knight, *Physics for Scientists and Engineers* and Hibbeler, *Engineering Mechanics: Static and Dynamics*)

Physics 191: Introduction to Astronomy (35 students the past year) (Text: Franknoi, Morrison, and Wolff, *Astronomy*)

Kelly Cheung Kellycheung5@gmail.com

BCIT British Columbia Institute of Technology

James Brewer	BCIT	<u>James Brewer@bcit.ca</u>

Information added at the meeting

- Part time studies now rebranded as Flexible Learning
- All courses individually have to break even, new policy at BCIT, so many Flexible Learning courses have been cancelled.



BCIT Physics Department Articulation Report, May 2023

The BCIT Physics Department has 11 full time faculty members, 3 technicians, and teaches around 1000 students in 17 different technologies.

There were no significant changes in the department this year.

I am attaching our internal transfer guide and would appreciate it if readers would let me know of any errors or missing information regarding their institutes.

James Brewer (jbrewer@bcit.ca)

Note from the chair: For the second year in a row, James was the first person with their report in. I owe him a beverage. Or two.

BCIT Physics, Course Credit Transfer Guide

- See Table 4 for Grade 11/12 equivalencies. •
- 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 (see: https://www.bcit.ca/admission/entrancerequirements/equivalencies/post-secondary/). A Physics 12/C is considered equivalent to Physics 11/C+.
- 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).

A: Credit granted only with instructor consent			
Technology	Cou	rses	
Biomedical Engineering	P11	78 ¹	
Diagnostic Medical Sonography	1073, 20	73, 3073	
Electro Neurophysiology	1280,	2280	
Food Technology	21	12	
Nuclear Medicine	1274, 2274,	3274, 4274	
Radiation Therapy	51	03	
Technology Entry	0311²,	0312	
B: Credit granted with a "General" post-seconda	ry (PS) course (s	ee Table 2) ³	
Technology	Term 1	Term 2	
Architectural and Building Engineering	1140	2148 ⁴	
Chemical and Environmental Technology	1181	2181	
Electrical and Computer Engineering	1143	2143	
Geomatics	1151	2151 ⁵	
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) ³			
Technology	Term 1	Term 2	
Civil Engineering	1192	2192	
D: Credit granted with a passing grade in a similar post-sec course within 10 years			
Astronomy	A3600	A7000	
Modern Physics	84	00	

Table 1: Physics Department's Courses.

Table 1 Footnotes:

- Students must have covered optics and waves. (1)
- (2) (3) An exemption will be considered for students who have taken PHYS 0309.
- (3) Recency requirement: Course(s) taken within last 5 years (exceptions will be considered).
 (4) PHYS 2148 has insufficient course credits to be used in place of other Term 2 courses.
- (5) PHYS 2151 has no labs applications to use in place of other Term 2 courses will be assessed on an individual basis.

Jpdated March-6-23

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, and possibly 2151	P/50%
Alexander College	141	142	C+/67%
Athabasca University	200	201	C+/67%
Camosun College	104,114,140	105, 115, (140&141)	C+/67%
Capilano University	110, 114	111, 115	C+/67%
College of New Caledonia	101, 105	102, 106	C+/67%
College of the Rockies	103	104	C+/67%
Columbia College	110	120	C+/67%
Coquitlam College	101	102	C+/67%
Douglas College	1107, 1110	1207, 1210	C+/67%
Fraser Intl. College	See SFU	See SFU	
Kwantlen P. University	1101, 1120, 1170	1102, 1220	C+/67%
Langara College	1101, 1125, (1219&2309)	1225	C+/67%
North Island College	100, 120	101, 121	C+/67%
Northern Lights College	103	104	C+/67%
Coast Mtn. College	101, 121	102, 122	C+/67%
Okanagan College	111, 112	121, 122	C+/67%
Selkirk College	102, 104	103, 105	C+/67%
SFU (before 2016)	(101&130), (120&131), 140	(102&130), (121&131), 141	C+/67%
SFU (2016 onward)	(101&132), (120&132), (125&132), 140	(102&133), (121&133), (126&133), 141	C+/67%
Thompson Rivers Uni.	1100, 1150	1200, 1250	C+/67%
TRU: Open Learning	(1103&1105)	(1203&1205)	C+/67%
Trinity Western Uni.	111	112	C+/67%
UBC, Vancouver	(107&109), (117&119), (170&119)	(108&109), (118&119), (158&159)	C+/67%
UBC, Okanagan	111, 112	121,122	C+/67%
Uni. of Fraser Valley	101, 111	105, 112	C+/67%
Uni. of Northern BC	100, 110	101, 111	C+/67%
Uni. of Victoria	102 ¹ ,102a, 110, 120	102 ¹ ,102b, 216	C+/67%
Van. Comm. College	1100	1200	C+/67%
Van. Island University	111, 121	112, 122	C+/67%
Yukon College	101	102	C+/67%

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

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.

Institute	PHYS 1192: Equivalent Calculus PS Course	PHYS 2192: Equivalent Calculus PS Course	Minimum Grade
Camosun College	140	(140&141)	C+/67%
Capilano University	114, See Footnote 1	(115&116), See Footnote 1	C+/67%
Douglas College	1110	(1110&1210)	C+/67%
Kwantlen P. University	1120	See Footnote 2	C+/67%
Langara College	1125	(1125&1225)	C+/67%
North Island College	120	(120&121)	C+/67%
Simon Fraser University	(120 or 125 & Lab) ³ , 140	See Footnote 4	C+/67%
Thompson Rivers Uni.	PHYS 1150, EPHY 1150	See Footnote 5	C+/67%
UBC (Pre-2018)	(153&170)	(153&170)	C+/67%
UBC (2018 onward)	TBD	(157&158&159)	C+/67%
Uni. of Fraser Valley	111	(111&112)	C+/67%
Uni. of Northern BC	TBD	111, See Footnote 6	C+/67%
Uni. of Victoria (Pre-2019)	102	102	C+/67%
Uni. of Victoria (2019 onward)	110, 120	See Footnote 7	C+/67%
Van. Community College	1100	(1100&1200)	C+/67%
Van. Island University	121	(121&122)	C+/67%
Advanced Placement Physics	AP-C (Mechanics)	-	C+/67%

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

Table 3 Notes:

- Students must apply for course credit and each application is subject to Institute approval. ٠
- 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:

- Capilano PHYS 110 and PHYS 111 are insufficient.
 Kwantlen PHYS 1220 has an insufficient overlap with PHYS 2192.

- (2) Kwantien PHYS 1220 has an insufficient overlap with PHYS 2192.
 (3) SFU Phys 120 & 125 have no lab, need 131 or 132, or other lab course.
 (4) SFU PHYS 121 & 126 both have 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).
 (7) UVIC 111 and 130 have insufficient overlap with PHYS 2192.

Camosun College

Chris Avis	Camosun College	AvisC@camosun.ca
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Information added at the meeting.

- Astronomy numbers down a lot, two sections cancelled maybe another will be cancelled.
- Partnering with high school has been very successful.
- Blended courses (lab in person and lectures online) have great enrolment but then the students find it is a large amount of work so a poor completion rate. Institution encouraging blended learning.
- Trades numbers are down a bit.
- Students appear to be chronically under prepared for college level courses.
- Interested in partnering/sharing with other institutions for a second year lab courses.



Camosun College Department of Physics and Astronomy Articulation Report - May 2023

The Department of Physics and Astronomy at Camosun College is located in Greater Victoria on the traditional territories of the Lekwungen and WSÁNEĆ people. Our department consists of seven continuing faculty, one lab technician, and two sessional instructors. In the past year one of continuing faculty members, Nancy McLean, retired and we hired Mike Zhong as a new continuing faculty member to replace her. Our Lansdowne courses generally serve the needs of academic upgrading and university transfer students and include:

- PHYS 070- a 0-level ABE Physics 11 course
- PHYS 090- a 0-level ABE Physics 12 course
- PHYS 101- a college prep Physics course which can also serve as a prerequisite in lieu of Physics 11
- PHYS 104/105- Parts 1 and 2 of first year algebra-based Physics
- PHYS 140/141- Parts 1 and 2 of first year calculus-based Physics
- ASTR 101- Astronomy- Night sky, solar system, and planets
- ASTR 102- Astronomy- Stars and Galaxies

Courses offered at our Interurban Campus are in service of diploma programs for various engineering streams as well as athletics and exercise therapy and health science. Along with reserved sections of PHYS 101 and 104, the following courses are restricted to students in engineering programs at the Interurban campus:

- PHYS 157- A first year Physics course focused on topics relevant to electronics and computer engineering students
- PHYS 210- Electricity and Magnetism
- PHYS 272- Energy and Sustainability
- PHYS 295- A Physics course for Engineering Bridge students focused on Waves, Optics, Electricity and Magnetism

Service courses for other career programs include:

- PHYS 160- Biomechanics- A service course for PISE (Pacific Institute for Sport Excellence)
- AHLT 165- Physics of Medical Imaging and Radiation Therapy. This course services the Medical Radiography and Sonography programs.

The second-year courses at our Lansdowne campus (PHYS 200, 210, 214, and 215) remain closed since 2010 owing to low enrollments. Second-year UT courses are struggling throughout the School of Arts and Science and it seems unlikely that these courses will be revived in the near future. The notion of delivering these courses in partnership with another small institution through an online or hybrid-delivery model has been discussed with our Dean, though no significant progress has been made here. If chairs at other institutions are in a similar position and interested in a potential collaboration, please reach out!

Enrollments in the 2022-2023 academic year showed a slight decline relative to the previous year (Table 1), but our numbers remain lower than prepandemic. We have not done a deep dive to elucidate exact causes but the effects across our school are generally attributed to continued reduced numbers of international students, a strong economy (particularly in the trades, impacting our engineering diploma programs) and high cost / low availability of housing in Greater Victoria. The most significant trend in our department has been a sharp decline in the number of students interested in our introductory Astronomy courses which will likely result in the loss of two sections of ASTR-101 in the coming academic year.

Our department has experimented with the delivery of blended courses with some sections of PHYS 070, 090, 101 and 104 being offered with lecture content being delivered asynchronously online and labs and tests delivered in person. It's somewhat challenging to directly compare demand for blended and face-to-face deliveries (Table 2), owing to different numbers of sections delivered in each modality and the fact that program students are typically forced into in-person classes. That said, results show that the blended sections are *at least* as popular as the in-person sections. Anecdotally, though, student success rates seem to be lower in the blended sections teach using other instructor's online resources owing to lack of preparation time to develop their own materials, leading to some student frustration. We will be experimenting in fall with adding an additional hour of tutorial time to the blended sections to see if this improves success rates and to try and assess whether to continue with blended courses moving forwards.

Other significant factors impacting our department includes:

- A college realignment of 0-level Science courses (impacting PHYS-070 and PHYS-090) which will be moved to the School of Access moving forward, resulting in the transfer of 1 FTE from Arts and Science to Access.
- An increased awareness of the importance of ensuring that our courses are accessible, in light of the recently-passed Accessible British Columbia Act. We have not been given firm direction by the college as of yet but expect that our teaching resources provided to students will come under increased scrutiny in the coming years.
- A general increase in the number of students requiring accommodations through our Centre for Accessible Learning. The most common

accommodation requested by students is extra time on tests, necessitating that tests be scheduled well in advance.

- A continuing trend away from mandatory textbooks from big publishers and towards instructor-generated resources and, (in the case of our Astronomy course) OpenStax
- Continued delivery of sections of our PHYS 104 at local high schools through our South Island Partnership Program.

Finally, I'll note that student performance and engagement is considerably lower across the board relative to pre-pandemic levels, particularly at the first-year level. Instructors across Arts and Science have noted that students seem woefully under-prepared for the rigors of post-secondary education including basic awareness of personal responsibility, academic integrity and study skills in addition to suffering from more instances of mental health challenges. Dealing with this demographic of students while covering the extensive content of a standard first-year curriculum has proven to be a real challenge and it makes me wonder if the student experience is contributing to our lower enrollments.

Speaking personally, the experience of teaching this new cohort of students has made me question the voluminous amount of content that we cover in first year Physics courses. The amount of content makes it challenging to find space for activities such as conceptual reasoning problems, problem solving, numerical analysis, simple programming and hands on demonstrations that might help to address some of the knowledge gaps our students are showing and make courses more engaging and potentially introduce more relevant 21st Century data analysis and scientific critical thinking skills. A reduction in content coverage in favor of the above activities might also help capture students who seem more interested in courses that have a higher emphasis on applied skills as opposed to more abstract theory. As a small institution, our curriculum is largely dictated by the need to articulate to larger institutions, but I would be very interested in a discussion around a modernization of the first-year curriculum if others are interested!

2021-2022 Academic Year		2021-2022 Academic Year 2022-2023 Academ		Academic Year
Course	Total students	Average #/section	Total students	Average #/section
ASTR-101	84	21	42	14
ASTR-102	22	11	30	15
PHYS-070	63	21	66	16.5

PHYS-090	0	0	43	21.5
PHYS-101	55	18.3	64	16
PHYS-104	176	25.1	144	20.6
PHYS-105	47	23.5	36	36
PHYS-140	68	17	65	16.3
PHYS-141	47	23.5	46	23
PHYS-157	43	21.5	46	23
PHYS-160	19	19	28	28
PHYS-210	56	28	39	19.5
PHYS-272	32	16	31	15.5
PHYS-295	40	20	37	18.5

Table 1: Enrollment Numbers in Camosun Physics Courses: 2021-2022 and 2022-2023

2021-2022 Academic Year

2022-2023 Academic Year

Course	Avg. #/in-person sect.	Avg. #/blended sect.	Avg. #/in-person sect.	Avg. #/blended sect.
PHYS-070			12	21.5
PHYS-101	16	23	11.5	20.5
PHYS-104	25.5	26.5	22.25	27.5

Table 2: Enrollment Numbers in In Person vs Blended Sections

Chris Avis, Acting Chair, Department of Physics & Astronomy Camosun College

Capilano University

Lauren Moffatt	Capilano	laurenmoffatt@capilanou.ca
	University	
Bruno Tomberli	Capilano	brunotomberli@capilanou.ca
	University	

Information added at the meeting by Lauren Moffatt

- Huge influx of international students. 30 sections have been added this summer
- Working on degrees
- Low enrolments in second year courses
- Third year experimental course getting great reviews so much that two fourth year students did their Capstone Project on physics. It is worth noting the students who are doing a Physics Capstone were bio majors. Converts!



Capilano University Articulation Report - May 2023

Classes have returned to all in-person learning, while using Learning Management Systems (Moodle) more heavily. Since the pandemic, all of our courses that previously used online homework systems, have switched completely to using Moodle for homework. We still require textbooks, however online subscriptions have let us reduce textbook costs to ~50\$ per course (and in some cases two courses). The only exception is Phys 116, our engineering statics course which is still using Mastering Engineering. We will be likely migrating to Moodle based homework for this course as well. Registration numbers were stable for most courses, and our overall registration numbers were slightly higher than last year. Single offerings of courses that are required by programs have been maintained with low enrolment numbers (~10-15 students) in the Fall. Our institution has admitted a large volume of international students this year, and our faculty added additional courses to compensate for the influx of students. This trend is continuing, and a large volume of international students are arriving and starting this summer. The Physics department is offering two Astronomy 106 classes during the summer to give these students courses to take.

We have started to offer one Astronomy course as an online course each semester, and this has helped with enrolment, and this will be a standard practice going forward.

		2022	2023		2023	2024
	Summer	Fall	Spring	Summer	Fall	Spring
Astr 106		1	0	2	1	1
Astr 142		1	1		1	0
Astr 300		0	1		0	1
Phys 104	1	2	2		2	2
Phys 112		1	0		1	0
Phys 113		0	1		0	1
Phys 114		2	1		1	1
Phys 115		1	1		1	1
Phys 116		1	1		1	1
Phys 200		0	0		1	0
Phys 203		0	1		0	1
Phys 310		0	1		0	1

For 2023-2024, we will be able to offer a similar course offering as 2022-2023 with a few modifications. The changes are summarized in the table below:

The first offering of Physics 310: Energy Technologies Lab was successfully run as a lab science offering for the BSc General. We had very low enrolment, but we pushed to have this run regardless as students who internally transferred from the Associates degree to the BSc during the soft launch 3rd year courses in order to graduate. While we had low numbers, the students were incredibly engaged with course, and the students themselves have been encouraging other students to take Phys 310 in the future.

We will also be offering Phys 200: Thermal Physics and Waves as a second year offering for the BSc General students who want to focus on the Environmental Science concentration within the degree.

Overall, our university is still pushing towards having more degrees, our BSc General has was soft-launched and we now have upper year students working through their degree. The Applied Clean Technology degree is at Stage II of development, and our higher level course offerings are being chosen to support both the BSc General and the future Applied Clean Technology students.

One additional comment, is that we have noticed a very high rate of absenteeism in our courses, and some instructors have reported a higher level of apathy in our students. I would be curious to hear if this is common with other institutions.

Coast Mountain College

Regan Sibbald	Coast Mountain College	rsibbald@coastmountaincollege.ca
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Information added at the meeting

- .New labs will be done next week
- Shared with the Trades Instructional Facility has been a big bonus.
- Erfon, long term instructor from Prince Rupert retiring.
- Hosting a radio antenna for NRC passively monitoring low frequency radio waves for climate information. At Prince Rupert campus. It was just installed last Friday. A network of north American sensors.



Coast Mountain College Physics Articulation Report 2023

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. Physics enrolments for 2022/23 were as follows.

Physics 101: 16Physics 102: 13Phys 121: 15Phys 122: 11Phys 135: 9

We continue to run algebra-based physics 101/102 (introduction to physics) in Prince Rupert which is video-conferenced to Terrace, and calculus-based physics 121/122 (advanced physics). Lectures are video conferenced to other campuses and there are face-to-face lab sections in each campus. The maximum number of students permitted in our labs is 18. 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). To satisfy the requirements of the engineering program we are running Physics 135 (engineering mechanics – dynamics) which is also video conferenced to other campuses. Most of our advanced physics students continue in an engineering program at another institution, however this year we also have an international student moving on to a computer science degree in England.

We will continue to use OpenStax textbooks for Phys 101/102/121/122, and Hibbeler, Statics and Dynamics, for phys 135. Our newly designed Physical Sciences Program (one-year certificate) is now separate from the Engineering program and is outlined on our website at this address. <u>https://catalogue.coastmountaincollege.ca/programs/physical-</u> <u>sciences/#programoutline</u>

Our labs are just being finished (still) and a new dry lab is being created with normal physics instrumentation, a 3D printer, and tools. We have a CNC plasma cutter available for use in cooperation with our trades department, ALCAN has donated a robotic arm for our ENGR program, and we have a new 3d virtual learning environment. We are working well with our trades department to share resources.

I am interested in offering second year physics and/or mathematics courses in partnership with another institution.

Regan Sibbald College Professor - Physics and Mathematics CMTN Terrace rsibbald@coastmountaincollege.ca (250) 635-6511 ext. 5253

College of New Caledonia

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

Information added at the meeting:



College of New Caledonia 2023 Physics Articulation Report

Physics courses at CNC were offered in a blended format over the past year. The lectures were delivered in-person (mostly) or online, tutorials and all labs were done in-person. We are planning all in-person course modality for the next year.

CNC offers UT calculus-based (PHYS 101, PHYS 102, PHYS 204) and algebrabased physics (PHYS 105, PHYS 106). They are part of the curriculum of Applied Science (Engineering) transfer program and general science transfer programs. Enrollment in UT physics courses was low this year mainly due to the absence of international students.

Additionally, the Physics Department 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 cohort admission, which has been 16 students till this year and is being increased to 18 students in 2023/2024.

Physics Department also delivers three physics courses for the Sonography Program: PHYS 170 – Physics for Sonography I, PHYS 173 – Physics for Sonography II and PHYS 175 – Physics for Sonography III. The maximum enrolment in these courses is based on the cohort admission, which is currently 16 students.

Barbara Rudecki, P.Eng. Department of Physics & Applied Science

College of the Rockies

Ben Tippett	College of the Rockies	Btippett@cotr.bc.ca
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Information added at the meeting.

- Enrolment back up to pre pandemic levels.
- Second year enrolment are low.



College of the Rockies Physics Articulation Report May 2023

College Of The Rockies (COTR) is a community college which serves six communities in the East Kootenay region. COTR is located in the unceded territory of the Ktunaxa people and the Kinbasket people. The main campus is located in Cranbrook. The physics/astronomy department consists of one instructor for university level courses, one instructor for adult upgrading courses, and a technician. There are no staffing changes to report.

The 2022-2023 academic year saw first year enrolment comparable to prepandemic levels. A pleasant surprise: the department agreed to run second year courses in spite of low enrolment. This is consistent with the department's informal policy to prioritize the needs of second-year students who plan on majoring in physics/astronomy when deciding whether to run a course.

The only curricular change of note involves using a final project instead of a final exam in Astro 100. This change was implemented during the COVID-19 epidemic, when large gatherings of students was inadvisable. While the instructor's opinion of the change was positive, Astro 100 returned to having a final exam; due to the need to formally revise the course outline to make the change permanent, and due to the advent of ChatGPT.

Enrolment Report:

- Physics 103, *Newtonian Mechanics*, 20 enrolled, 19 completed
- Physics 104, Intro to Electromagnetism, 12 enrolled, 12 completed
- Physics 201, Analytical Mechanics, 2 enrolled, 2 completed
- Physics 202, Modern Physics, 2 enrolled, 2 completed
- Astronomy 100, Introduction to Astronomy, 18 enrolled, 14 completed

We adopted new textbooks for all physics courses.

- Phys 103 adopted Mazur's "Principles & Practice of Physics Vol 1" and we implemented a pre-reading requirement.
- Phys 104 adopted OpenStax "University Physics Volume 2."
- Phys 201 adopted "The Feynman Lectures on Physics".
- Phys 202 adopted OpenStax "University Physics Volume 3."

There are a few infrastructure changes to report.

- Blackout blinds have been installed on the windows of the physics lab and we are very big fans of them.
- COTR's department of Applied Research and Innovation is assembling a "Maker Space," and has purchased four 3D printers, a 3D scanner, a laser engraver, soldering stations, oscilloscopes, Arduino kits and Lego Mindstorm kits.
- Local amateur Astronomer Dr. William Newsome has donated a 14inch diameter Telescope, and an observatory dome. The dome will be permanently installed on the roof of Patterson hall in the future, for use of our astronomy class.

Question for other institutions

Should first year physics students learn to use Late χ in the first year physics labs?

Benjamin K. Tippett Instructor Math, Physics, Astronomy

Columbia College

Vladan Jovovoic	Columbia College	vjovovic@columbiacollege.ca

Information added at the meeting



Physics & Astronomy Articulation Report 2023

The enrolment in Physics courses at Columbia College, for the 2021/2022 academic year, was like this:

Summer 2022

Physics 100 Physics 110	- 30 - 15
Physics 120	- 3
Physics 205	-1
Physics 12	-26
Fall 2022:	
Physics 100	- 8
Physics 110	- 18
Physics 130	- 4
Physics 11	- 14
Physics 12	- 13

Winter 2023:

Physics 100	- 34
Physics 110	- 12
Physics 118	- 4
Physics 120	- 11
Physics 12	- 21

The enrollment was good in high school Physics courses, Physics 100 (Physics for Future Leaders), and Physics 110 (Newtonian Mechanics). On the other hand, it was rather low in the rest of first year UT Physics courses for science and engineering majors (Physics 118, 120, and 130). The interest in our second year Physics courses was almost nonexistent.

Vladan Jovovic, Ph.D.

Coquitlam College

Janusz	Coquitlam College	janusz@coquitlamcollege.com
Chrzanowski		

Information added at the meeting

- No major changes
- Most of the students are international, most from Indian, and most of whom are interested in Associate Degrees and want to join the work force as soon as possible so more social science interest.
- Low enrolment in physics except for the one course needed, PHYS101.
- PHYS 102 cancelled for the last seven semesters as there was no interest. Higher level chemistry courses also cancelled due to lack of interest
- Currently two campuses, the main one in Coquitlam with a small satellite campus in Surrey. New location will be at the Broadway Technical Centre in Vancouver on Virtual Road. That move will occur by the end of this year so Coquitlam College will be located in Vancouver and Surrey.



Coquitlam College Report to Articulation May 2023

There have been no major changes in the Physics Curriculum at Coquitlam College during the academic year 2022/2023. Due to the current circumstances, in the academic year 2022/2023 the College Administration decided to offer some of the UT courses online (25%) and the rest (75%) to be taught in person.

Coquitlam College continues to offer first year calculus-based Physics courses. Physics 101 (mechanics with an introduction to thermal Physics) and Physics 102 (electromagnetism and optics). The lectures and the labs for Physics 101 have been offered online, while Physics 102 was not offered in the fall 2022 and the spring 2023 semesters due to the very low interest.

The enrolment in Physics 101 and 102 has been steadily declining over the last few years. In the last academic year, the enrolment in Physics 101 was relatively stable with \sim 15 - 18 students/semester. The number of students interested in Physics 102 (electromagnetism and optics) has dropped substantially to less than 3 - 4/semester. A similar tendency has been observed in other science classes (no Chem 102 in the Spring 2023).

The changes in the demographics of the international students at Coquitlam College continue. We observe a steady increase in the number of students from India, and a substantial decline in the number of Chinese and other international students. The current enrolment at the College is about 3000 students.

The College has currently one (main) campus in Coquitlam and a second one (satellite) in Surrey. Recently, the Administration of the College has decided to transfer the school to a new location at the end of the year. This new place currently undergoes adaptation work.

At present there are no plans for the second-year Physics courses.

Janusz Chrzanowski, PhD Coquitlam College

Corpus Christi College

Information provided at the meeting

- Enrolment also dipped during the pandemic and it has not recovered. 5-10 students for most of the courses while pre-pandemic it was 20.
- New course this year, a one credit first year lab course PHYS119, modeled on UB 119 as most of the students transfer to UBC.
- Excel is expensive for this course and would like information from others. UBC responded right away that they are using Python, moving away from Excel.



Report from Corpus Christi College 2023

Founded in 1990, Corpus Christi College is a Catholic two-year liberal arts college located on UBC's campus. The college offers over eighty courses in a variety of subjects, including two physics courses and one astronomy course. Approximately 20% of the students at the college are international students. (https://corpuschristi.ca/). Since 2000, Corpus Christi college has been an institutional member of the BC transfer system.

The college offers over 90 university transfer courses in a variety of subjects, including two physics courses and one astronomy course. Enrolment at the college is between 250-450 students, and approximately 20% of the students at the college are international students. Many of our students transfer to UBC after one or two years at Corpus Christi college.

Since 2010, we have been offering PHYS 101 (Energy and Waves). Enrolment in this course varies, with anywhere from 28 students (2020) to 9 students

this year (2023). Starting in 2015, we have purchased the necessary lab materials for PHYS 101, allowing us to offer this course on campus.

Since 2016, we have added ASTR 210 (Exploring the universe – The Solar System). This course is usually offered every other year. Enrolment varies from 5 to 15 students. Since 2020, the textbook for the course is the OpenStax astronomy textbook.

Since 2020, we have offered PHYS 100 (Introductory Physics: Mechanics and Heat), with enrolments at 5-10 students. This course uses the OpenStax college physics book.

As of 2023, we are offering the one credit lab course PHYS 119 (Experimental physics lab I), which is modelled on the UBC course. The emphasis of this course is on data analysis and scientific reasoning.

Alain Prat Corpus Christi College <u>aprat@corpuschristi.ca</u>

Douglas College

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

Information added at the meeting

- Astronomy course enrolments are still strong. We run four sections over two semester all and winter. For liberal arts students.
- How have other people fit the thermodynamics into the first year Common Core Engineering Curriculum.
- Engineering program is growing, so we have extra students and the new students are strong.



Physics and Astronomy Articulation 2023

Over the last year, we continued our usual full offering of courses. Across all our courses we have seen a small decrease in enrollment of approximately 2% (down to 583 this year from 595 last year). However, this is result of an increase in enrolment in our calculus-based courses (1110, 1210, 1170) balancing out a decline in our algebra-based courses (1104, 1107, 1207). The increase in the calculus-based courses is likely a result of strong and increasing enrolment in our engineering program.

Although registration for S2023 is ongoing, our PHYS 1104 course has 31 students (in 1 section) registered and PHYS 1107 has 29 students (across 2 sections) registered. These enrollments (particularly in PHYS 1107) are down from last summer. Our PHYS 1210 section has 21 registered students, which is an increase over the S2022 enrollment. Each course section has a capacity of 36 students.

Course	Sections S F W	Students S F W	Change From Previous Year	Textbook
PHYS 1104	1 1 1	34 26 35	-5 (-5%)	OpenStax College Physics - Custom Edition
PHYS 1107	2 2 1	45 55 34	-35 (-20%)	OpenStax College Physics - Custom Edition
PHYS 1207	0 1 1	0 12 13	-3 (10%)	OpenStax College Physics - Custom Edition
PHYS 1110	0 2 1	0 72 37	+10 (+10%)	OpenStax University Physics
PHYS 1210	1 0 2	11 0 43	+2 (+4%)	OpenStax University Physics
PHYS 1170	0 0 1	0 0 37	+11 (+42%)	Mechanics Map Digital Textbook
ASTR 1105	0 2 2	0 70 59	+8 (+7%)	OpenStax Astronomy - Custom Edition

S|F|W = Summer 2022 Semester (May-Aug) | Fall 2022 Semester (Sept-Dec) | Winter 2023 Semester (Jan-Apr) The capacity of one section is 36 students.

In addition to our regular courses, we offered several courses as guided study sections including PHYS 2250 (Introduction to Modern Physics), PHYS 1108 (Physics for Life Sciences I) which is a lecture only course designed to match SFU PHYS 101, and PHYS 1208 (Physics for Life Sciences II). We were hopeful that we would see an increased demand for the PHYS 1108 and PHYS 1208 courses from life science students that do not requires a physics lab for their programs. However, this interest and demand has not materialized over the past few years. As a result, we will not be offering these courses next year. Similar courses in our MATH department (for example, Calculus I for Life Sciences) have also seen weakening demand.

Course	Sections (S F W)	Students (S F W)	Textbook
PHYS 2250	0 0 1	0 0 4	Modern Physics (Krane)
PHYS 1108	0 0 1	0 0 4	OpenStax University Physics
PHYS 1208	1 0 0	1 0 1	OpenStax University Physics

*S/F/W = Summer 2022 Semester (May-Aug) / Fall 2022 Semester (Sept-Dec) / Winter 2023 Semester (Jan-Apr)

During the year, we have updated the curriculum guidelines of some of our algebra-based physics course (PHYS 1104 and PHYS 1107) to improve the clarity of the learning outcomes and course content. We have also updated the

curriculum guidelines for our calculus-based physical science stream courses (PHYS 1110 and PHYS 1210) to match the common first-year engineering curriculum more closely. The update for PHYS 1110 is effective starting September 2023, and the update for PHYS 1210 is effective starting in January 2024. As part of these updated curriculum guidelines, we have worked on changes to some of the labs to include a greater emphasis on data analysis and a stronger focus on students creating and iterating procedures.

As evidence by the growing enrollment in PHYS 1110, 1210, and 1170 our engineering program continues to grow. Based on anticipated demand, we will be adding an additional section of PHYS 1110 in the Fall 2023 semester, and an additional section of PHYS 1170 in the Winter 2024 semester.

Will Gunton Physics and Astronomy Department Chair

Jennifer Kirkey added that an outreach event is being planned for the New Westminster campus on Saturday October 14 2023, for the upcoming solar eclipse. It will begin at 8:08 am with the maximum 82% coverage occurring at 9:20 am, ending at 10:38 am.

Some faculty are already planning their trips to Texas for the April 8 2024 total solar eclipse.

Fraser International College

Peter Smith	Fraser International College	smin@learning fraseric ca
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Information added at the meeting

- Cuteness award for the dog arriving during his report
- Major revision of the active learning courses PHYS140 and 141 in consultation with SFU.
- Makerspace has been a success
- All is open except online homework. Using Moodle homework for some. Jennifer mentioned WeBWorK as the "pickup" truck of online homework systems
- Makerspace conference hosted at UBC May 24/25 today is the deadline
- No final exam, now three tests (15-20-20) and one final major design project.



1. Institutional Update

- General: FIC offers international students a direct pathway to 2nd year at SFU. Spring 2023 saw a full return of all courses to in-person delivery. Enrolment continues to grow toward pre-pandemic numbers. Note that FIC does not offer any Astronomy courses at this time.
- Budgets/Facilities: No significant changes to facilities. We continue to maintain safety guidelines under the FIC Communicable Diseases Plan as required, including enhanced cleaning protocols.
- Students/Enrollment: Enrolment has remained fairly consistent year-over-year with approximately 260 students registered into Physics courses from Summer 2022 through Spring 2023.

- Staffing: The Physics courses continued with 2 continuing contract instructors.
- Instruction/Open Education Resources: PHYS 140 and 141 at FIC and SFU have both undergone extensive revisions over the last year. All course material is now available for free to students via Moodle. We have also switched from FlipIt to ExpertTA for online homework assignments.

2. Program/Course Update

- Course Offerings: Current course offerings include the following courses:
 - PHYS100: Introduction to Physics (97 enrolled)
 - PHYS140: Mechanics and Modern Physics (99 enrolled)
 - PHYS141: Optics, Electricity and Magnetism (72 enrolled)
 - PHYS1441: Optics, Electricity and Magnetism Lab (72 enrolled)

There were no courses cancelled during the period of this update.

- Curriculum Developments: In all three courses at FIC, we have moved to a three test/one major project format. The reception to this change by the students has been positive, especially with regard to the final project.
- Transfer Credit Applications or Alterations: FIC has primarily been a sending institution but has taken steps over the 2022/23 academic year to increase articulation as a receiving institution.
- Issues: Pass rates overall dropped slightly, falling by 6% across all courses on average. Notably, pass rates were lower in PHYS100 & 140 but higher in PHYS141. The full return of classes to in-person was welcomed but instructors have noted that many students are missing the necessary background/ foundation or familiarity to be successful. Students have been struggling with motivation, focus, and

engagement as they re-adjust to in-person learning after the pandemic.

• Research/Projects: N/A

3. Other Items of Interest

- Immigration delays and student mobility restrictions continue to affect enrolment trends and the return to pre-pandemic numbers continues at a slow pace.
- Student wellness issues continue to be more prevalent. Academic accommodation as well, has increased. Absenteeism increased as the semester progressed (due to illness).
- FIC has maintained a Learning and Teaching team to support instructors with course modification and design in Moodle, and to provide professional development workshops on key topics notable this reporting period student wellness, engagement, reconciliation, academic integrity, and AI in the classroom.

Peter Smith

Kwantlen Polytechnic University

Takashi Sato Kwantlen Polytechnic University <u>Tak</u>	<u>ashi.Sato@kpu.ca</u>
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Information provided at the meeting

- Absorbed ABE into the department.
- At Douglas College ABE Math now became MATU (math upgrading) with free tuition. Slow growth in the numbers since tuition has been free.
- Michael Poon commented that withdrawal date is now the last day of classes. Camosun also has that late a deadline and it has been a disaster. Problem with end of term group projects as folks are still registered but not attending.



Kwantlen Polytechnic University 2023

Kwantlen Polytechnic University has campuses in Richmond, Surrey, Cloverdale, Surrey Civic Plaza and Langley. The Physics Department operates on three of them with X faculty and 8 support staff, augmented by part time personnel, as needed. 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 (calculus-based physical science stream and calculus-based life science stream) and engineering transfer, as well as 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*.

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, even within the same university. Since our last report (May 2022), we ran our usual offerings for Summer, Fall and Spring^{*} semesters. While some departments at the University still run predominantly online, the physics department is back to offering a full complement of in-person classes and labs.

- I. In addition to in-person sections, we do continue to run online sections of PHYS 1100 (since before the pandemic) and ASTR 1100 (since during the pandemic) each with online lab options.
- II. The B. Sc. major in Physics for Modern Technology has been undergoing a program review, now in its final stages. We received a largely positive report from the external visiting team and are preparing a quality assurance plan for approval this summer.
- III. Due to administration's plans on campus space, our student workshop has been reallocated to a new department and is no longer available for Physics students for their projects. Our School of Design is graciously sharing some of its facilities but a permanent solution for project space is being sought.
- IV. A new lab space is being constructed this fall to house the work space for the CloudLab, which provides remote access to lab equipment. This turn of events was also precipitated by reallocation of space to the new department.

In addition, a major outreach event is being planned for Richmond campus on October 14, for the upcoming solar eclipse.

Takashi Sato

Langara College

Bradley Hughes	Langara College	<u>bhughes@langara.ca</u>
Tyron Tsui	Langara college	<u>ttsui@langara.ca</u>

Information provided at the meeting

- Enrolment has gone up quite a bit at the college, but not in physics.
- Our registration caps have been set at 50/50 domestic/international students.
- Fall second year courses cancelled due to low enrolment, but the spring ones ran.



Langara College Physics and Astronomy Articulation Report 2023

Over this past year, our offerings included first and second year university transfer physics, an engineering mechanics class, courses for students who do not have grade 11 or grade 12 physics, and two semesters of first-year astronomy courses for science students and a set for non-science students. Unfortunately, our dean cancelled our second-year lab course and our second-year modern physics course due to low enrolment. In total, we ran 42 sections with around 900 students enrolled. This roughly the same as last year, but still down from 1200 in years before that. Our registration caps have been set at 50/50 domestic/international students. At the time of writing, we have a 45 international students on waitlists for our first-year algebra-based physics for our summer session. That is the same number of international students already registered in our summer sections.

Our last online section was offered Summer 2022 and we currently do not have any plans to offer online sections anymore. Our departmental Equity, Diversity and Inclusion Coordinator position has transitioning into a committee within the department. Langara College hired a single coordinator to collaborate with individual departments through the college. We are currently in the process of updating course learning outcomes with input from our EDI committee and college coordinator. Tyron Tsui snəweyəł leləm - Langara College on the unceded land of the Musqueam nation

LaSalle College

Charles Cue	LaSalle College	ccue@lasallecollegevancouver.com
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Information added at the meeting.

- Enrolment generally up after the pandemic huge increase
- Associate of arts degree launched and that has been a great draw but it has only one physics course
- Working on reducing the credit count in the Bachelor of Science in Games Programming so likely two of the physics classes will be merged into one with more lab time, about 6 students graduate with about 100 in the program right now.
- New campus opening soon right by Renfrew Skytrain Station



4. Institutional Update

• General

LaSalle College Vancouver continues to evolve as part of the LCI Education Network. Located on 5 continents, LCI Education has 23 higher education campuses and some 2,000 employees supporting more than 20,000 students from around the world, each year. Our decentralized business model encourages each campus to operate independent boutique schools. LCI Education harmonizes its programs from one country to the next, promoting greater flexibility and life-ready learning experiences, better control over the quality of its services, and deeper respect for the various cultures with which it works. While acting locally to offer the best learning experiences, campuses also benefit from being part of a global network with over a 60-year legacy and an established reputation for excellence. LCI Education's unique business model is a point of pride, borne out by our network's strength. LCI Education has been named one of Canada's Best Managed Companies. LAB Vancouver (Language Across Borders) moved to our campus starting July 1st, 2020. This move integrated our English Language school on our campus and provided additional supports for students who intend to apply for our Academic programs.

• Budgets/Facilities

- Our current building has undergone some changes in 2022 with continued implementation of our Bachelor of Fashion Design degree (BFD), and the increased enrollment in our Associate of Arts degree (AoA). To support the BFD program, the two textile labs continue to be evolved. Unused administrative space was revisited to create new lecture classrooms to support the High School, LAB and our Liberal Studies courses.
- In addition, construction on our new purpose-built campus is underway in what used to be the adjacent parking lot. The campus will be designed with multifunctional spaces, including an auditorium. Extensive consultation with all stakeholders including faculty, staff, and students over a 3-year period has resulted in a building plan that touches all the details one could imagine. Once ready we will have a full semester of overlap and there will be no disruption to classes.

• Students/Enrollment

- For the Spring 2023 quarter which started on April 3, we have 1444 students in all programs. Of those there are (these represent both diploma and degree students) 13 students who are enrolled in Physics courses in Spring 2023, and 46 since Summer 2022.
- In comparison, for the Spring 2022 quarter, we had 556 students in all programs. Of those there were 14 students enrolled in Physics courses in Spring 2022, and 67 since Summer 2021.

• Staffing

- Over the past year, there have been several changes and additions to our staff, largely due to the influx of new students. These changes include five key positions in Academics and Student Services:
 - Dr. Jamie Kemp, Chief Academic Officer, who joins LCV on May 1st
 - Aditya Akre, Campus Director, who joined LCV in October 2022

- Sajia Ebrahimi, Program Director Associate of Arts, who transitioned from faculty in March 2023
- Trevor Van den Eijnden, Program Director Graphic Design, who joined the Academic Department in February 2023
- Corrie Heringa, Interim Chief Academic Officer, from February 2023, and transitioning to Academic Director in July 2023

In addition, we have added two Academic Advisors, and are hiring new fulltime faculty, a Student Experience Coordinator, and an Assistant Registrar positions.

• Instruction/Open Education Resources

LCV has a longstanding history in online delivery; our College is part of the global LCI network with its own digital learning partner, Ellicom, which has offered online courses and programs for several years. LCV utilizes Omnivox as our full feature LMS (course content sharing, learning modules, assignments, gradebook, drop box, discussion forums, announcements, etc.); it provides faculty and students with the necessary tools for managing online learning. There are additional institutionally supported tools to allow faculty added options. Faculty have individual licenses to Microsoft TEAMS for synchronous delivery, office hours, and individual consultations. These tools also allow students the ability to view recorded sessions to reinforce learning. These tools facilitate a robust online learning experience where faculty can exert their cognitive, teaching, and social presence in engaging learners in an interactive learning environment.

• All of these tools require sign-on authentication and are only accessible to LCV students and faculty through their assigned course loads. Some faculty also leverage web-based social media tools when appropriate. Given the design and media nature of our programs, all faculty and students have access to a number of software tools including Adobe Creative Cloud. Some of our media arts program require high-end computing and access to specialized software; we have initiated cloud based and VPN solutions through *Splashtop* that allows students and faculty remote access to our high-end computers on campus and the specialized software installed on those computers.

• As of Winter 2022, we have fully returned to on-campus delivery of all programs. We continue to leverage online/blended learning to accommodate faculty and students who are either needing to stay virtual for health concerns or need to flex on occasions to remote delivery.

5. Program/Course Update

• Curriculum Developments

- LCV has embarked on a mission to align its degrees with the standard duration and credit-weight within the British Columbia's higher educational structure. The College's historical (US-based) ownership and educational systems had dictated 180-credit versions of the Baccalaureates programs, which were not in line with BC's systems and institutional offerings. As such, the College has committed to offering its degree programs, without unnecessarily taxing students financially, timewise, or even academically by mandating courses that are not normally required within their respective fields. The proposals currently before the DQAB present a reduction of the program length in terms of total program credit hours (originally 180) and duration (number of terms) to ensure the regulatory and market standards are met, towards an ultimate benefit of the students. In addition, break terms have been inserted to ensure that students are not burnt out during their course of study at LCV.
- None of the changes affect any of the originally approved elements of the programs in terms of degree level standards, program learning outcomes, academic rigor or targeted learners. With faculty consultation and Education Council approval, the reduction was made through removing unnecessary courses (some were made electives) or ones with overlapping learning outcomes and adjusting the credit weight of some courses towards the standards used in BC institutions and BCCAT system.
- Our Math and Physics classes will stay the same as we believe these courses are vital towards game development. We have also merged some physics programming applications of our Math and Physics for Games (VGP256) class into our Calculus for Physics (VGP246) and Physics of Light, Motion, and Sound classes (VGP248).

• Transfer Credit Applications or Alterations

As of February 2023, LCV currently accepts credit for 668 courses from 23 different institutions as identified in the BC Transfer Guide. In addition, 148 LCV courses are accepted by 29 different institutions as identified in the BC Transfer Guide.

As of May 1^{st} , 2023, LCV has 11 agreements for 1 Physics course with 11 institutions.

• Issues

Since Fall 2022 we have seen a significant increase in the number of students applying for our Associate of Arts degree. As mentioned previously, we have adjusted some underutilized spaces to create new classrooms. In addition, many of these students struggle with Math and English, and we have therefore adapted accordingly to offer more resources including writing workshops and peer tutoring.

• Research/Projects

While the primary responsibility for faculty is teaching and the scholarship of teaching and learning, there are several faculty who were also engaged in scholarly activities during the reporting period. However, these faculty teach primarily in applied programs.

6. Other Items of Interest

As mentioned previously, LaSalle College Vancouver we will be moving into a new education center built just for us that puts technology, active learning, and social engagement at the forefront. It will be seven floors with over 108,000 square feet. This new facility is set to open in 2024. It will feature purpose-built studios, roof top garden, gaming lounge, and a suspended lecture hall that opens to a sound stage. <u>New Campus Opening in 2024 |</u> LaSalle College In Vancouver, BC, Canada (lasallecollegevancouver.com)

North Island College

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Jennifer Fallis-	North Island College	Jennifer.FallisStarhunter@nic.bc.ca
Starhunter		

Information provided at the meeting

- Enrolment up for calculus and algebra is down, and success rate are down in the algebra stream due to students being less prepared
- Program reviews ongoing for the last several years first for the engineering program and then the math/science courses. So far not a lot of changes have come out from the reviews
- Encourages an abbreviated list of content for the first year courses. Too much content and not enough time to focus on. Content often cut at the end of the semester.

NORTH ISLAND COLLEGE



NIC Physics Articulation Notes 2023

Numbers

Completions for first-year algebra-based physics (PHY 100 and 101) were way down this year, but calculus-based physics (PHY 120 and 121) completions were up slightly. Our two introductory Space Science and Astronomy courses were steady, both being delivered digitally this year.

Program Review

Our entire math, science and engineering department has been undergoing program reviews the past two years, and our Math, Physics, and Computer Science half of the department completed our review and submitted it to the

dean last fall. Unfortunately, we have had no feedback from the review from the dean's office and no additional resources to implement the proposed changes. Since the review, Computer Science has been removed from our department so that might be part of the reason for the delay.

Dennis Lightfoot

Northern Lights College

Morteza Ghadirian	Northern Lights College	mghadirian@nlc.bc.ca
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Information added at the meetings

- Huge increase in enrolment numbers, from 12 to 27. One course had a maximum of 48 and the lab can only hold 18 people.
- Active learning strategies with flipped classroom working well



Northern Lights College 2023 Physics Articulation report

NLC offered two Physics courses in the 2022/2023 academic year:

- 1) PHYS 103 Mechanics and Waves calculus-based (28 students)
- 2) PHYS 104 Electricity and Magnetism and waves calculus-based (17 students)

These courses primarily serve the following credentials at NLC:

- 1) Engineering Studies Certificate common core first year transfer to Engineering Degree granting institutions in BC
- 2) Engineering Certificate first year transfer agreement with University of Alberta
- 3) Associate of Science degree

There has been a noticeable increase in the number of Physics students this year, and there were some students on the waiting lists each semester. The Physics lab at Northern Lights College has a capacity for 18 students and there was a need for multiple lab sections for Physics 103. Nine (9) of the students in the physics courses were in participating in the engineering program.

Active learning strategies were used during the past two semesters for teaching Physics at Northern Lights College and the feedback from the learners and the final class averages showed positive impacts.

Morteza Ghadirian

Okanagan College

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Information added at the meeting

- Numbers rebounding but still a long way to go to match pre pandemic levels
- Small drop in calculus based and small increase in algebra
- Taught hybrid this year but not doing it next year as too challenging. Will do online versions of those courses but with weekly in person labs.
- Second year astronomy thanks to DRAO and UBC-O
- Had a cyber attack the first day of classes and still recovering
- Strong movement to OER
- Breakfast program started due to food insecurity and many of the students partaking are international students
- Bachelor of science in nursing has been stopped at the college.



Okanagan College - Physics & Astronomy Articulation Report - 2023

Terry Bridges (Dept Chair)

Okanagan College has four main campuses: Salmon Arm, Vernon, Kelowna, and Penticton. Kelowna is our largest campus, accounting for \sim 65% of Arts & Science students. The Physics & Astronomy Department has 7 full-time faculty members, one of whom shares an appointment with the Mathematics & Statistics Department. We had three term faculty teaching with us this academic year.

Our department falls under the Science and Technology portfolio, which will have a new Dean in the spring of 2023.

	2016 - 2017	2017 - 2018	2018 - 2019	2019 – 2020	2020- 2021	2021- 2022	2022- 2023
Applied	773	1005	928	827	636	582	661
Enrolled	319	417	348	333	232	217	254

Recent enrollment history at OC for the Associate of Science degree across all OC Campuses:

Enrolment notes:

• Applications & enrollments are rebounding from the low numbers during COVID, but are still down from the numbers a few years ago. We see steady second year registrations in PHYS & ASTR courses.

Course/Enrolment Updates:

• Our courses offered at Okanagan College were the same as last year:

	2019-20	2020-21	2021-22	2022-23
PHYS112/122 – Algebra-based Physics I & II	229	179	132	149
PHYS111/121 – Calculus-based Physics I & II	95	80	75	52
PHYS126 – Physics for Electronic Engineering	22	21	16	14
PHYS200 – Relativity and Modern Physics	7	7	7	6
PHYS215 – Thermodynamics	38	27	26	11
PHYS202 – Engineering Mechanics I	13	9	8	11
PHYS240 – Biophysics	Not offered	8	4	2
ASTR110/111/112/120/121/122-Astro I&II	74	90	50	93
ASTR220 – Astrobiology	32	28	29	14
ASTR230 – History of the Universe	34	46	30	25

- Comments on 2022/23 figures:
 - We had many fewer Engineering Bridge students this past year, which largely explains the enrolment drop for PHYS 215.
 - We were happy to see the large enrolment increase in our firstyear astronomy courses, and the numbers are the highest they've been in several years.
 - In the past year, we offered Hybrid courses in PHYS 111 (SA), PHYS 112 (Penticton), PHYS 121 (Vernon), PHYS 122 (Penticton). These courses were challenging to teach for our instructors, and we will not be offering Hybrid courses in 2023/2024.
 - We offered the following online courses last year: one section of ASTR 110/111/112, one section of ASTR 120/121/122, ASTR 220, ASTR 230, and PHYS 240. This will continue in 2023/2024.

- We continued to offer an out-of-sequence PHYS 112 course in the winter semester, and it had a good enrolment of 29 students.
- A combined PHYS/MATH Emphasis for the Associate of Science degree was approved this year by the Faculty of Science & Technology. This is the first Emphasis at the College to include Physics.

Prospects for 2023/2024: As of April 20, application numbers for new Associate of Science students are similar to last year. In Kelowna numbers are up by ~5%, in Penticton down by ~15%, in Vernon down by ~25%, and in Salmon Arm almost double those of last year.

- We will be offering a new out of sequence PHYS 122 in Fall 2023 to give our students more flexibility. We will continue to offer the following courses online: PHYS 112/122, PHYS 240, ASTR 110/111/112, ASTRO 120/121/, ASTR 110/111/112 and 120/121/122, ASTR 220, and ASTR 230.
- We will be offering our first-year ASTR courses in-person on the Vernon campus again.
- We may offer our PHYS 202 (Engineering Mechanics) online or in hybrid format in Winter 2024.
- We have hired one Continuing member and two Term members for 2023/2024.

New courses post 2023/2024:

 ASTR 210, Fall 2024: this is a second-year astrophysics course, based on UBCO's course. This course will be taught in alternating years at UBCO and OC.

PHYS 228, Winter 2025: this is our second-year Classical Mechanics course. It is not a new course for us, but it has not been taught in many years. We will be offering it to give our students a more complete second-year program.

Terry Bridges (Dept Chair)

Quest University



https://questu.ca/

From their web site

"Quest To Suspend Regular Academic Programming. At its February 22, 2023 meeting, the Quest University Canada Board of Governors made the difficult decision to suspend regular academic programming following completion of the current academic year in April 2023. This action is being taken so the Board and the Executive can focus on restructuring finances and operations."

I contacted the previous physics articulation representative and confirmed that they would not be attending articulation this year."

- The university still legally exist but we do not know what that means.
- No one know what will happen in the future.

Selkirk College

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Jason Mickel	JUINII K GUIICEC	JIIICKCI@SCIKIIK.ca

Information added at the meeting

- Going well with numbers about back to normal. Start with 30 in both streams of calculus and algebra. Engineering cohort and the rural medicine cohort.
- 80% domestic students and a new first year physics lab with a collaborate space design.



Selkirk College May 2023

Selkirk College serves the West Kootenay region of BC. Our physics courses serve students in the first-year engineering transfer program, the rural premedicine program, as well as students enrolled in general arts and science. No major changes occurred to course content this year.

The same courses and textbooks were:

•PHYS 102/103 – Algebra-based. OpenStax College Physics

•PHYS 104/105 – Calculus-based. OpenStax University Physics

•PHYS 200 – Engineering Mechanics - Statics. Engineering Mechanics:

Statics(14th ed.) by Hibbeler, R.

•Astronomy 102 (not offered since 2013).

Textbooks utilized:

- OpenStax College Physics, for PHYS 102/103.
- OpenStax University Physics, for PHYS 104/105.
- *Engineering Mechanics: Statics* (14th ed.) by Hibbeler, R., for PHYS 200.

Enrollment is about the same from last year. In comparison to the 5-year average, enrollment is up 8%. This year, 60 unique students attended in the Fall, and 43 in the winter.

Our newly renovated Castlegar Campus physics laboratory had its inaugural year! Students are more engaged with other lab pairs more than ever before, largely due to the 5-stations of 2 facing work desks. We use Vernier Go Direct® sensors with the Graphical Analysis App with positive feedback from students.

A brief report on the college from VP Education and Students, Taya Whitehead: Selkirk College has been back to "business as usual" for the 2022/23 academic year. Construction is underway for two new residences, one on the Castlegar campus and one at the Nelson Silver King campus, providing an additional 148 student housing units. The college also took over ownership of the Trail campus, which saw the launch of the new Practical Nursing Diploma program in January. The college has had significant changes in our Executive Leadership Team this past year following the retirement of long-term college employees, President Angus Graeme and Vice President Rhys Andrews. We were excited to welcome Dr. Maggie Matear as our new President & CEO in spring of 2022. Additionally, Taya Whitehead has been appointed the Vice President, Education & Students and Brier Albano has been appointed the Associate Vice President, Student Success.

Simon Fraser University

Eldon Emberly	Simon Fraser University	eemberly@sfu.ca
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Additional Information shared at the meeting:

- Studio physics stream with an active learning focus is taught at Surrey Open Stax University Physics with Expert TA as the online system. PHYS140/141
- Enrolment numbers are up with, with lower numbers in upper year as the Covid impact works its way through the system.



SFU Departmental Report 2023

This has been our first fully face to face academic year since the pandemic. All courses were run as previously. Many instructors have continued to record their lectures, which SFU facilitates and students appreciate. As with all institutions, we are seeing evidence of ChatGPT being used in a variety of contexts by students and faculty and are working on ways to use it as a pedagogical tool.

Here are several items worth noting in SFU Physics curriculum for this year:
1. We offered our course PHYS 346 (3) Energy and the Environment in spring 2023 after a several years of not being offered.
2. First-year Textbook Summary:
Physics 100 (physics 12): OpenStax College Physics
Physics 101/102 (life sciences): Flipit Physics + Freedman et al., College
Physics 2nd Ed.
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 can be seen below.

Course #	Course Name	Title	Author
PHYS 100	Introduction to Physics	SFU version of OPENSTAX	Openstax
		COLLEGE PHYSICS	
PHYS 101	Physics for the Life Sciences I	College Physics + FlipIt Physics	Freedman
PHYS 102	Physics for the Life Sciences II	College Physics + FlipIt Physics	Freedman
PHYS 120/140	Mechanics and Modern Physics	FlipIt Physics	
	Studio Physics-Mechanics	Physics for Scientists and Engineers	Tipler
PHYS 121/141	Optics E+M	FlipIt Physics	
	Studio Physics - E+M	Physics for Scientists and Engineers	Tipler
PHYS 125	Mechanics and Relativity	Physics (V1)	HALLIDAY, RESNICK AND KRANE
PHYS 126	Electricity, Magnetism and Light	Matter and Interactions	Chabay and Sherwood
PHYS 132	Physics Laboratory I	MEASUREMENTS AND THEIR UNCERTAINTIES : A PRACTICAL GUIDE TO MODERN ERROR ANALYSIS	HUGHES/Oxford
PHYS 133	Physics Laboratory II	MEASUREMENTS AND THEIR UNCERTAINTIES : A PRACTICAL GUIDE TO MODERN ERROR ANALYSIS	HUGHES/Oxford
PHYS 190	Intro to Astronomy	OPENSTAX ASTRONOMY	Openstax
PHYS 211	Intermediate Mechanics	INTRODUCTION TO CLASSICAL MECHANICS	David Morin
PHYS 231	Physics Laboratory III	MEASUREMENTS AND THEIR UNCERTAINTIES : A	HUGHES/Oxford

Eldon Emberly, Chair, Physics Undergraduate Curriculum Committee, SFU

		PRACTICAL GUIDE TO MODERN ERROR ANALYSIS	
PHYS 233	Physics Laboratory IV	MEASUREMENTS AND THEIR UNCERTAINTIES : A PRACTICAL GUIDE TO MODERN ERROR ANALYSIS	HUGHES/Oxford
PHYS 255	Vibrations and Waves	Waves and Oscillations	Walter Fox Smith
PHYS 285	Quantum I	A first introduction to quantum physics	Kok
PHYS 313	Special Relativity	TBD	
PHYS 321	Intermediate Electricity Magnetism	INTRO TO ELECTRODYNAMICS	GRIFFITHS/Pearson
PHYS 326	Electronics/Instrumentation	ELECTRONIC PRINCIPLES	MALVINO/McGraw-Hill
PHYS 332W	Advanced Physics Lab I	MEASUREMENTS AND THEIR UNCERTAINTIES : A PRACTICAL GUIDE TO MODERN ERROR ANALYSIS	HUGHES/Oxford
PHYS 344	Thermal Physics	Basic	Carrington, Gerald
	·····	Thermodynamics	
PHYS 346	Energy and the Environment	Thermodynamics Physics of Energy	Jaffe and Taylor
PHYS 346 PHYS 347	Energy and the Environment Intro. To Biological Physics	Thermodynamics Physics of Energy PHYSICAL BIOLOGY OF THE CELL	Jaffe and Taylor PHILLIPS/Taylor&Francis
PHYS 346 PHYS 347 PHYS 365	Energy and the Environment Intro. To Biological Physics Semiconductor Device	Thermodynamics Physics of Energy PHYSICAL BIOLOGY OF THE CELL SEMICONDUCTOR PHYSICS & DEVICES	Jaffe and Taylor PHILLIPS/Taylor&Francis NEAMEN/McGraw Hill
PHYS 346 PHYS 347 PHYS 365 PHYS 384	Energy and the Environment Intro. To Biological Physics Semiconductor Device Methods of Theoretical Physics	Thermodynamics Physics of Energy PHYSICAL BIOLOGY OF THE CELL SEMICONDUCTOR PHYSICS & DEVICES Mathematical Physics	Jaffe and Taylor PHILLIPS/Taylor&Francis NEAMEN/McGraw Hill BUTKOV/Pearson
PHYS 346 PHYS 347 PHYS 365 PHYS 384 PHYS 385	Energy and the Environment Intro. To Biological Physics Semiconductor Device Methods of Theoretical Physics Quantum II	Thermodynamics Physics of Energy PHYSICAL BIOLOGY OF THE CELL SEMICONDUCTOR PHYSICS & DEVICES Mathematical Physics A Modern Approach to Quantum Mechanics	Jaffe and Taylor PHILLIPS/Taylor&Francis NEAMEN/McGraw Hill BUTKOV/Pearson Townsend/USB
PHYS 346 PHYS 347 PHYS 365 PHYS 384 PHYS 385 PHYS 390	Energy and the Environment Intro. To Biological Physics Semiconductor Device Methods of Theoretical Physics Quantum II Introduction to Astrophysics	Thermodynamics Physics of Energy PHYSICAL BIOLOGY OF THE CELL SEMICONDUCTOR PHYSICS & DEVICES Mathematical Physics A Modern Approach to Quantum Mechanics Introduction to Cosmology	Jaffe and Taylor PHILLIPS/Taylor&Francis NEAMEN/McGraw Hill BUTKOV/Pearson Townsend/USB Ryden/Addison-Wesley
PHYS 346 PHYS 347 PHYS 365 PHYS 384 PHYS 385 PHYS 390	Energy and the Environment Intro. To Biological Physics Semiconductor Device Methods of Theoretical Physics Quantum II Introduction to Astrophysics	Thermodynamics Physics of Energy PHYSICAL BIOLOGY OF THE CELL SEMICONDUCTOR PHYSICS & DEVICES Mathematical Physics A Modern Approach to Quantum Mechanics Introduction to Cosmology Extragalactic Astronomy & Cosmology	Jaffe and Taylor PHILLIPS/Taylor&Francis NEAMEN/McGraw Hill BUTKOV/Pearson Townsend/USB Ryden/Addison-Wesley Schneider/Springer
PHYS 346 PHYS 347 PHYS 365 PHYS 384 PHYS 385 PHYS 390 PHYS 391	Energy and the Environment Intro. To Biological Physics Semiconductor Device Methods of Theoretical Physics Quantum II Introduction to Astrophysics	ThermodynamicsPhysics of EnergyPHYSICAL BIOLOGY OF THE CELLSEMICONDUCTOR PHYSICS & DEVICESMathematical PhysicsA Modern Approach to Quantum MechanicsIntroduction to CosmologyExtragalactic Astronomy & CosmologyNone	Jaffe and Taylor PHILLIPS/Taylor&Francis NEAMEN/McGraw Hill BUTKOV/Pearson Townsend/USB Ryden/Addison-Wesley Schneider/Springer
PHYS 346 PHYS 347 PHYS 365 PHYS 384 PHYS 385 PHYS 390 PHYS 391 PHYS 395	Energy and the Environment Intro. To Biological Physics Semiconductor Device Methods of Theoretical Physics Quantum II Introduction to Astrophysics Computational Physics	ThermodynamicsPhysics of EnergyPHYSICAL BIOLOGY OF THE CELLSEMICONDUCTOR PHYSICS & DEVICESMathematical PhysicsA Modern Approach to Quantum MechanicsIntroduction to CosmologyExtragalactic Astronomy & CosmologyNone	Jaffe and Taylor PHILLIPS/Taylor&Francis NEAMEN/McGraw Hill BUTKOV/Pearson Townsend/USB Ryden/Addison-Wesley Schneider/Springer

		CLASSICAL MECHANICS	GOLDSTEIN/Pearson
PHYS 415	Quantum III	MODERN APPROACH TO QUANTUM MECHANICS	TOWNSEND/USB
PHYS 421	Electromagnetic Waves	INTRO TO ELECTRODYNAMICS	GRIFFITHS/Cambridge
PHYS 431	Advanced Physics Lab II	No textbook	
PHYS 445	Statistical Physics	STATISTICAL AND THERMAL PHYSICS	Gould/Prinston University
PHYS 455/855	Modern Optics	OPTICAL PHYSICS	LIPSON/Cambridge
PHYS 465	Solid State Physics	The Oxford Solid State Basics	Simon/Oxford
PHYS 485/871	Particle Physics	MODERN PARTICLE PHYSICS	THOMSON/Cambridge
		INTRO TO ELEMENTARY PARTICLES	GRIFFITHS/Wiley
PHYS 490/881	Relativity and Gravitation	Spacetime and Geometry: An Introduction to General Relativity	Carroll/Pearson
		Gravity: An Introduction to Einstein's General Relativity	Hartle/Benjamin- Cummings
PHYS 492/881	HEP Techniques	Particle Detectors	Grupen, Claus/ Cambridge
		Introduction to Experimental Particle Physics	Fernow, Clinton, Cambridge
Thompson Rivers University

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-	University	-

Information added at the meeting

- Enrolment steady with domestic down a bit and international up a bit
- Program review from a few years ago resulted in new labs in the third and fourth year.
- Major renovations causing a challenge.



Physics Articulation Report 2023

Mark is on sabbatical this year but submitted this report.

We will be starting to implement changes to the Physics program in the next year. The changes were a direct result of Program Review. In an attempt to support student success, we have shuffled Mathematics courses into second year. Ideally this will allow students to complete all of their Math courses by the end of year 2 (Calc 4 and Diff Eq 2 in Winter of second year). We have also replaced an analog electronics course/lab (PHYS 2150) co-listed with engineering with an electronic material course (PHYS 2590) with associated laboratory. We have also moved our Intermediate electrodynamics to third year.

The other major change has been to decouple lab and lecture courses, and offer an upper-level lab each semester in 3rd and 4th year.

PHYS 3090 - analog electronics lab (Diodes, BJT, FET, OP Amp, PID control)

PHYS 3590 - digital electronics lab (digital gates, microcontrollers, DAQ, motor control)

PHYS 4090 - Optics Laboratory (Basic elements, Fourier Optics, Double slit/single photon, Interferometry, Spectroscopy, Fibre Optics) PHYS 4590 - Advanced Laboratory (Various Options)

The laboratory courses are each 3 credits. The 4000 level courses will double as introduction to research, and communication as major learning outcomes. These labs will have a final formal lab report which will undergo a peer review process, then be compiled in a journal (Physical Review EH!) and presented to students.

The other change has been to create capstone experiences for students as part of institution learning outcomes. We have designated the following courses: Advanced EM, Advanced QM, Advanced Lab, and directed studies as options. These capstone courses all occur in the winter term of their final year of study. Trinity Western University

Arnold Sikkema	Trinity Western University	Arnold.Sikkema@twu.ca
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Information added at the meeting

- Stan who retired in 1994 just passed away in December. An obituary in Physics Today will be published soon.
- Bob Wood is back in the physics department after some years in administration
- Working with CLAC towards a collective agreement. If it occurs then TWU will be the first Christian university to be unionized.
- Google forms being used for in class as opposed to clickers or mobile phones. Like to hear about it.



TWU is located on the traditional ancestral unceded territory of the Stó:lō people.

Report for the BC Articulation Committee Meeting 2023

- TWU Physics mainly serves our B.Sc. programs in Biology, Chemistry, Mathematics, and Computing Science, as well as our preengineering/engineering transfer options. Physics I also is one option among 16 for our required liberal-arts and -sciences core curriculum in our "scientific method & lab research" category.
- Physics is part of our Department of Mathematical Sciences, which includes math, computing science, physics, pre-engineering, data science, and statistics.
- The only 200+ level courses that remain, after intake to our concentration and minor were suspended effective January 2021, are those used as options in the chemistry and mathematics programs: 220 (mechanics), 230 (electricity & magnetism, with lab), 240

(thermodynamics, with lab), 321 (differential equations), 341 (quantum chemistry)

- Courses offered in 2022-23, with enrolments:
 - o 111: Fundamentals of Physics I, with lab: 48 (with 6 failing)
 - 112: Fundamentals of Physics II, with lab: 27
 - 321: Differential Equations: 14 (cross-listed as mathematics and taught by math faculty)
 - 341: Advanced Physical Chemistry I: 2 (cross-listed with chemistry; lab taught by chemistry faculty)
- For Physics 111/112, we used Randall D. Knight, *Physics for Scientists and Engineers: A strategic approach*, 5th edition (Pearson, 2022), with MasteringPhysics. I continue to use a semi-flipped model, delivering short lectures via video before class and holding fully interactive class meetings for demonstrations, clicker-type questions, with peer-instruction, and solving problems.

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

University of British Columbia – Okanagan

Christina	University of British Columbia-	Christina.haston@ubc.ca
Haston	Okanagan	

Information added at the meeting

- Physics has been down 30% and down for the last three year due to change in
- Medical physics has been steady and 15 graduated.
- Registration software changes upcoming there is going to be a terrible discontinuity. It might affect articulation. We do not know what is going to happen. Concerns about how transfers will happen might not be smooth. Trying to run the two systems in parallel.
- Warn students about the chaos.



At UBC Okanagan, we offer two streams of first-year physics. The PHYS 111/121 stream in for students interested in the physical sciences (40% of students) and the PHYS 112/122 stream is intended for students planning to enter programs within the life sciences (60% of students). Both streams are calculus-based. In both streams, students that have not completed grade 12 physics are required to enrol in a tutorial section.

The PHYS 111/121 stream uses the OpenStax University Physics textbooks (volumes 1 and 2, respectively).

The PHYS 112/122 stream uses University Physics for the Life Sciences first edition by Knight, Jones and Field.

Changes to the Bachelor of Science degree requirements, beginning in 2020/21W, resulted in students only being required to complete "at least three credits of experimental science in any of BIO, CHEM, EESC, or PHYS courses with labs." Since this change enrolment in the first term courses of the streams (PHYS 111 or 112) has remained at ~700 students while enrolment in the second term courses of the streams (PHYS 121 or 122) has declined ~30%. The university will not offer second term first year physics in the summer this year as it's not seen as economically worth it.

Average enrollment in second year PHYS courses is 20, down from \sim 35 students prior to 2019, and 4th year enrollment was 15 students and is now 10. This year we have 10 graduating students (3 honours, 4 majors and 3 combined math/physics majors).

We offer MSc and PhD programs in Medical Physics and currently have 15 students, combined, in these programs.

At UBC Okanagan, physics is in the Department of Computer Science, Mathematics, Physics, and Statistics.

Sincerely,

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	Vancouver	

- Stable enrolment. Did not take a big hit due to pandemic. Back to in person teaching.
- Students do not wear masks in class.
- Registration software changes upcoming there is going to be a terrible discontinuity. It might affect articulation. We do not know what is going to happen. Concerns about how transfers will happen – might not be smooth. Trying to run the two systems in parallel.
- Warn students about the chaos that might ensue.



UBC-Vancouver Physics & Astronomy Articulation Committee 2023

There are currently 104 students in Physics or Astronomy degree programs in 4th year (or above), compared to 112 (2022), 125 (2021), 124 (2020), 137 (2019), 135 (2018), 96 (2017), 92 (2016), 69 (2015), 93 (2014), 93 (2013), and 79 (2012). They are: 42 majors physics, 3 majors astronomy, 10 combined-honours astronomy & physics, 17 honours physics, 6 combined honours biophysics, 10 combined-major physics & computer science, 7 combined-honours physics & computer science, 8 combined-honours physics and math, and 1 combined-honours physics & chemistry.

There are 90 students who have applied to graduate this year, compared to 84 (2022), 82 (2021), 80 (2020), 85 (2019), 73 (2018), 60 (2017), 57 (2016), 46 (2015), 70 (2014), 57 (2013), and 49 (2012). These numbers are smaller than the number of students in 4th year or above because many students take more than 4 years to complete their degree.

There are 48 students applying for graduation in engineering-physics this year, compared to 74 (2022), 56 (2021), 35 (2020), 70 (2019), 65 (2018).

First year physics and astronomy students take PHYS 117 (mechanics), PHYS 118 (E&M), and PHYS 119 (1-credit lab). The enriched track is PHYS 106 (mechanics), PHYS 108 (E&M), and PHYS 119 (1-credit lab). Physics and astronomy degree students are encouraged but not required to take the PHYS 129 lab. Other science students usually take PHYS 131 (a range of topics). Engineering students take PHYS 157 (thermal physics and waves), PHYS 158 (E&M), PHYS 159 (1-credit lab), and PHYS 170 (engineering statics and dynamics).

Mechanics courses should not normally be articulated to PHYS 131. Mechanics lecture courses with no lab component should articulate to PHYS 117. E&M lecture courses should articulate to PHYS 118. If both terms of physics have a lab component, that should map to PHYS 119, as well as lecture courses. A separate lab course should map to PHYS 119.

Articulating to PHYS 101 is deprecated, because it doesn't count toward a physics degree, and is discontinued and will be removed from the Calendar. Articulating to PHYS 102 is deprecated, because it has been discontinued and replaced by PHYS 118 and will be removed from the Calendar.

UBC-Vancouver is in the process of changing our student registration system software. This will likely impact transfer credits for a year or two.

Dr. Tom Mattison

University Canada West

	Zahra Mahyari	University Canada West	zahra.mahyari@ucanwest.ca
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Information added at the meeting

- Lots of administration changes.
- Still experiencing huge growth at the college with most students from Punjab India doing an associate of arts degree.
- No growth in physics with some courses being cancelled, maybe add an astronomy course.



UCW is currently offering Phys 101 with estimated 120 enrolments per year.

Institutional Update

General

UCW is pleased to be operating fully on campus with all services and facilities open to students and faculty both in person and virtually at both our Vancouver House and West Pender campuses. There has been a return to on campus events for students, faculty, and staff; however, the university continues to also offer events and workshops online.

Students/Enrollment

- UCW continues to experience growth in student enrollments.
- Our student body currently represents over 120 nationalities with the top percentage of students coming from India (54.2%), Sri Lanka (5.87%), Nigeria (4.39%).
- Other nationalities represented include Columbia, Philippines, Brazil, and Iran.
- We currently have almost 13,000 students enrolled as of April 2023 with over 3200 new students who just joined us for the Spring 2023 term.
- Please see the student enrollment details in the Table 1 below (enrollment figures include new starters and continuing students).

Programs	2020	2021	2022 (Winter Term)	2023 (Spring Term)
MBA	2247	4679	7749	9572
BCom	133	348	452	662
BABC	48	120	145	203
AA	553	1099	1704	2514
Total	2981	6246	10050	12951

Table 1: Student Enrollments

Staffing

- Dr. Stephanie Chu was promoted to Associate VP of Teaching, Learning, and Scholarship as of December 2022.
- Kathleen Campbell was appointed as Associate VP of Administration as of May 2022.
- Amy Hua was appointed as Director, Academic Planning and Budgeting as of September 2022.
- Harpreet Ahluwalia was promoted to Director, Curriculum and Quality Assurance as of October 2022.
- Douglas Thorpe-Dorward was appointed as Director, Faculty Relations as of August 2022.
- Jenny Shickele was appointed as Director, Finance as of May 2022.
- Sparsh Sood was promoted to Associate Director, Facilities and Health and Safety as of February 2023.
- Abrar Ahamed was promoted to Associate Director, Digital Transformation as of October 2022.
- Bradley Fehr was promoted to Associate Director, Communications as of January 2023.
- Madison McLeod was promoted to Associate Director, Marketing as of January 2023.
- Dr. Jill Cummings was appointed as UAP Department Chair as of February 2023
- With the continued student growth, UCW has also increased our number of support staff. Please see the staffing growth in the Table 2 below (faculty numbers include both sessional and continuing full-time faculty).

Table 2: UCW Staff Growth

Department	April 2021 Staff	April 2022 Staff	April 2023
Academics	15	33	54
Administration	4	10	11
BD - Recruitment	8	10	13
Finance	15	17	29
Health & Safety	1	5	5
Human Resources	4	10	17
Library & Information Services	6	10	12
Information Technology	13	17	12
Marketing & Communications	8	13	18
Office of President	3	5	10
Registrar Office	33	45	56
Student Affairs	11	27	44
UAP Faculty	7	10	22
Faculty	174	201	416

Instruction

- UCW's Centre for Teaching Excellence has launched a Teaching Excellence micro-credential for Faculty, which includes asynchronous components such as:
 - o Classroom Management
 - \circ Course Design
 - Universal Design for Learning
 - Instructional Methods, etc.

Open Education Resources

- UCW continues to update courses to use OER textbook and resource options wherever available. The current focus in on the Associate of Arts degree.
- Our OER committee works with course developers, faculty, and Department Chairs to identify options to update our courses where appropriate.

• Funding is available to incentivize Faculty to update their course using OER options.

Program Update

- UCW is currently working on new program development within our graduate area. Two proposals have been put through to the Degree Quality Assessment Board (DQAB) for consideration.
 - Master of Entrepreneurship
 - Master of Marketing

Curriculum & Course Developments

- The Bachelor of Commerce degree is in the process of finalizing articulation of all courses associated with ENTRY TO THE CPA PROFESSIONAL EDUCATION PROGRAM (CPA PEP). The in-depth review has resulted in 13 CPA courses being articulated thus far with the remaining two to be completed by Summer 2023.
- UCW is currently finalizing the cyclical review process with the Degree Quality Assessment Board (DQAB) for all programs at the university. Self-study committees, PAC meetings, and external reviews have been completed.

Other Items of Interest

UCW is currently offering Phys 101 with estimated 120 enrolments per year.

UCW Associate of Arts students need to complete a 3-credit quantitative Science course, a 3-credit lab-based Science course and a 3-credit additional Science course to be eligible for graduation. Since Phys 101 is one of the many offered Science courses, the enrolment numbers are currently low. UCW is evaluating the possibility of adding a few Physics and Astronomy courses and is exploring the feasibility of offering more Science programs for students. University of the Fraser Valley

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Peter Mulhern	University of the Fraser Valley	Peter.Mulhern@ufv.ca
Carmen	University of the Fraser Valley	Carmen.herman@ufv.ca
Herman		

Information added at the meeting:

- Carmen in person. Still recovering from the pandemic, them the floods, then two surprise retirements. Still 50% sessional and hiring two more people this year.
- Enrolment is down a bit but the number of graduates is steady thank to the mechatronics program
- Astronomy courses do not do that well so would like to talk to those institutions where they are doing well.



2023 Physics/Astronomy Articulation Report

The Physics Department at University of the Fraser Valley offers Physics Honours, Major, and Minor programs within the BSc.

Enrolments and graduates:

Enrolments:

	2022- 2023	2021- 2022
1 st year calculus-based, Engineering/Physics stream	226	242
(Phys 111 Mechanics, Phys 112 E&M)		
1 st year algebra-based, Service courses	124	131

(Phys 101 Mechanics/Fluid, Phys 105 Heat/Waves/Wave)		
ASTR 101 Solar System, ASTR 103 Astronomy (solar system)	70	103
2 nd year (Phys 221 Intermediate Mechanics, Phys 225 Waves and Introductory Optics, Phys 231 Thermodynamics)	46	63
3 rd /4 th year physics courses	128	168

Graduates: 10 Physics major graduates

1st year texts:

- OpenStax texts are used in all of our 1st year service courses (so all noncalculus based).
- Young and Freeman "University Physics" is still used in our mainstream calculus-based courses (PHYS 111/112), but probably won't be long. We have heard that the publisher won't be printing out hard-copy texts anymore, and instead is moving towards electronic only versions of their books. As a result (and to help offset the costs to students), the department has started to consider open-source alternatives for all first-year course offerings. Any suggestions are welcome.

Other notes:

- Due to the (continuous) shortage of the instructors, we were not able to offer ASTR 104 Stars/Galaxies/Cosmos, and PHYS 100 Introductory Physics I once again.
- The sessional rate is more than 50% even with a permanent hire last year (although the staff-shortage will ease up a bit with two new hires starting this fall).

Lin Long Lin.Long@ufv.ca

University of Northern British Columbia

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

Information added at the meeting

- Commenting on the math background of students. Even in calculus based first year course for engineers the students are poor on algebraic manipulation. Asked if there were placement tests at other institutions. The answer was no.
- VIU is looking at this seriously due to the same concerns being expressed to help streaming.



University of Northern British Columbia Physics Department 2023

UNBC offers a full physics program. No major curriculum changes in first-year and second-year were made during 2022 - 2023.

Lectures and labs in summer PHYS 115 (grade 12 equivalent) continue on-line so that students do not have to come to campus in the summer.

Entering math skills continue to be problematic, even for students in calculusbased physics. Placement test?

OpenStax texts were used for calculus-based first-year physics, and for one semester of astronomy.

Enrolment

PHYS 115 (Physics 12)	2020	2021	2022
Summer	14	19	16

Fall	45	42	26

PHYS 100	2020-	2021-	2022-
	2021	2022	2023
Fall	60	59	79
Winter	45	31	32

PHYS 101	2021	2022	2023
Winter	60	31	26

PHYS 110	2020	2021	2022
Fall	70	64	55

PHYS 200	2021	2022	2023
Winter	8	4	6

PHYS 111

Winter

PHYS 205	2020	2021	2022
Fall	10	6	8

PHYS 206	2021	2022	2023
Winter	9	2	6

ASTR 120	F2020	W022	F2022
	63	64	54

ASTR 121	W2021	F2021	W2023
	46	49	50

Textbooks

PHYS 202

Fall

	2020-2021	2021-2022	2022-2023
Physics 115	Physics, Cutnell and Johnson	Physics, Cutnell and Johnson	Physics, Cutnell and Johnson
(physics 12)			
Physics 110/111	Physics for Scientists and	OpenStax	OpenStax
(calculus-based)	Engineers, Serway and		
	Jewett		
Physics 100/101	College Physics, Serway and	College Physics, Serway and	College Physics, Freedman,
(algebra-based)	Vuille	Vuille	Ruskell, Keston, and Tauck
ASTR 120/121	21 st Century Astronomy,	Universe, Geller, Freedman,	Universe, Geller, Freedman,
(Astronomy)	Kay, Palen, and Blumenthal	Kaufmann (120); OpenStax	Kaufmann (120); OpenStax
		(121)	(121)

George Jones

University of Victoria

Mark Laidlaw	University of Victoria	laidlaw@uvic.ca
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Information added at the meeting

- We did an experiment "lazy online courses" for first year calculus courses. Offered one section of online with in person labs, tests and final exams. Students were not willing to do the watch the videos to help their success. So they are going to pare these offerings far back. "A swing and a miss", but they learned what worked. They did not use an instructional designer. The regular students also had access to those videos as this was done by Flipped Classrooms.
- Brief discussion about the need for instructional designer and a huge demand for online resources from students.
- Academic accommodation demands is up by a factor of 3-4 so there are not enough seats to proctor exams, etc. So giving everyone a 4.5 hour exams. Students were happier but did not do any better.



UVic $1^{\mbox{\scriptsize st}}$ and $2^{\mbox{\scriptsize nd}}$ year PHYS and ASTR articulation report, May 2023

University context: UVic's domestic enrolment is at target. International enrolment, after having risen at the start of the pandemic, has reverted to trend; that trend is below what was centrally budgeted, so there have been some significant cuts (\sim 4% of budget) across all units impacting faculty, staff, and administrative(!) positions. A likely consequence of this is a marginal decrease in course offerings (number of sections) primarily in small (for PHYS "upper year" courses).

1st year PHYS:

As an experiment we offered online sections of our algebra-based and calculus-based streams during the large-enrolment terms. They were offered asynchronously, however exams (at least final exams) were in person and the

labs were face-to-face. The use-case was students who had trouble fitting the regularly scheduled lecture sections in because of conflicts with other required courses. In the calculus-based stream we found attrition higher and attainment lower than in the face-to-face classes.

Our overall enrolment returned to immediate pre-pandemic levels in both the algebra-based and calculus-based streams. UVic's international enrolments have been lower over the past two years, and this means a smaller incoming cohort for Engineering. We are seeing systematically higher attrition and poorer performance in the first course of the calculus-based stream, but things look more-or-less normal in the second course. We're interpreting this as reflecting the preparation of the incoming student cohort, and that the difficulty of the first course is unchanged.

We are finally moving on our comprehensive curriculum refresh. The first part is designing a 3rd year lab course to bridge between our 2nd year and honours offerings. We expect to be decoupling labs from our 2nd and 3rd year courses and creating "Lab in [Topic]" courses. We also expect to be doing a 10-15% redesign and topic shuffling of our core theory courses (Classical, E&M, Quantum, and Thermal/Statistical) to improve the integration of computational work into our curriculum.

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 2022: 533 ('21: 645, '20: 563, '19: 510, '18: 519, '17: 473) Final enrolment PHYS 102B:

Spring 2023: 428 ('22: 499, '21: 465, '20: 403, '19: 377, '18: 330) 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 700-750 Final enrolment PHYS 110:

Fall 2021: 510 (21: 525, 20: 438, 19: 493,18: 498, 17: 556, 16: 599, 15: 606)

Spring 2022: 191 (22: 202, 21: 196, 20: 144, 19: 144, 18: 156, 17: 162, 16: 154)

Past off-schedule offerings Summer 2021: 47 Final enrolment PHYS 111:

Spring 2022: 404 (22: 334, 21: 297, 20: 406, 19: 420, 18: 490, 17: 448, 16: 460)

Summer 2022: 83* (22: 72, 21: 87, 20: 68, 19: 61, '18: 77, '17: 71, '16: 84)

Past off-schedule offerings Fall 2021: 87

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: 73 (21: 66, 20: 76, 19: 67, 18: 62, 17: 57, 16: 74, 15: 88, 14: 104)

Final enrolment 130: 47 (22: 47, 21: 57, 20: 57. 19: 48, 18: 42, 17: 49, 16: 58, 15: 68)

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.

We are currently piloting two courses at the second year level

- Introduction to Medical Physics (2nd year offering)
- Introduction to Quantum Computing (1st year offering)

The change in instruction method in March means that it's hard to draw lessons about their success.

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 onhysics

Geophysics

Enrolment: About 60 (20 as PHYS, 40 as EOS).

Enrolment: 2022: 29 (21: 43, 20: 47, 19: 65, 18: 56, 17: 62, 16: 32, 15: 51)

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 2023: 44 (22: 44, 21: 65, 20: 52, 19: 57, 18: 49, 17: 42, 16: 46, 15: 35)

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 2022: 55 (21: 37, 20: 58, 19: 57, 18: 75, 17: 72, 16: 64, 15: 67, 14: 53)

- PHYS 223 Introductory Quantum Computing Enrolment 2023: 11 (22: 9, 21: 10)
- PHYS 232 Introductory Biomedical Physics Enrolment 2023: 14 (22: 9, 21: 11, 20: 9, 19: 15)

PHYS 248 – Computer Programming in Math and Physics Normally offered in the spring.
Primary Audience: PHYS, ASTR, and MATH major and honours students Text: None standardized The course was previously cross-listed with MATH, and because of different program needs that coupling has been dissolved. Enrolment 2023: 50 (22: 62, 21: 48, 20: 43, 19: 57, 18: 32, 17: 5)

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 changed in response to the 2017 retirement of a long-serving staff member.

In the fall and spring terms this year the ASTR 101 instructor experimented offering a small (24 cap) fully online synchronous version of the course, including online labs. The lecture to the in-person cohort was simultaneously broadcast for the online students. All assessment was online. The instructor reports being happy with the experiment.

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 2023: 47 (22: 52, 21: 60, 20: 57, 19: 62, 18: 50, 17: 61, 16: 72, 15: 83)

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.

Courses offered:

ASTR 201 – Search for Life in the Universe Primary Audience: General interest Text: Readings Enrolment: 50-70. Normally offered in the fall, not offered the past two years.

ASTR 250 – Introductory Astrophysics

Primary Audience: ASTR major/honours students Text: Freedman and Kaufman - Universe Enrolment: 2022: 28 (21: 32, 20: 25, 19: 28, 18: 30, 17: 27, 16: 24, 15:

33, 14: 24)

Normally offered in the fall.

ASTR 255 – Planetary Science

Primary Audience: ASTR major/honours students Text: Varies depending on instructor Enrollment: 2023: 14 (22: 22, 21: 22, 20: 13, 19: 18, 18: 9, 17: 15, 16:

11, 15: 10)

Normally offered in the spring.

This course is now being taught by a new faculty member specializing in exoplanets; there may be changes to this course reflecting his research interest.

Vancouver Community College

Andy Sellwood Vancouver Community College asellwood@vcc.ca

Information provided at the meeting

- Modest rebound in numbers
- Program review
- Website will be redesigned as it is a mess
- Working for a plan for online/blended learning
- 65% of UT students are doing health sciences stream with only 50% doing 5 classes or more.
- ABE numbers are still small even though tuition is free, again.
- Andy is back in the class after years in the Learning Centre in ciurriculum development role.



Report to UT Physics and Astronomy Articulation 2023

Enrolments have overall seen a modest increase in university transfer in science at VCC. We ran two sections of the first half of our calculus-based 1st year physics (PHYS 1100) in fall 2022; a fully in-person version with 9 students and a hybrid version with 10 students. For the hybrid version lectures are online but labs are in-person.

In winter 2023 we ran one hybrid and one in-person section of the second half (PHYS 1200) with 12 students and 8 students respectively. We also ran an online section of PHYS 1170, our Mechanics course for engineers, with 10 students. For the second time we ran a section of Introduction to Astronomy (PHYS 1110), which is aimed at non-science students. This course was offered in a hybrid format with 7 students.

Andy Sellwood

Vancouver Island University

Brian Dick Vancouver Island University Brian.Dick@viu.c	Brian Dick	Vancouver Island University	Brian.Dick@viu.ca
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Information added at the meeting

- Two retirees so two new full time professors have brought new energy and eyes to refreshing the labs, etc.
- Scheduling in the fall with 4 Mondays being a holiday, so how are we adapting? More online labs?
- Students' math background have been challenging, as well as difficulty reading written instructions.
- Ministry of Education has adapted D2L Brightspace platform as their LMS as choice across the sector, and VIU is using that and happy with it.



VANCOUVER ISLAND

Vancouver Island University Report 2023

Vancouver Island University is located on the traditional, ancestral, and unceded territory of the Snuneymuxw, Quw'utsun, Tla'Amin, Snaw-naw-as, and Qualicum First Nations.

Course	2022/23	2021/22	2020/21	2019/20
PHYS 111	67	68	76	75
PHYS 112	53	35	61	50
PHYS 121	49	51	57	47
PHYS 122	34	37	45	24
ASTR 111/112/311/312	92	122	130	115

General Activities

92 122 130 115

• Two full-time physics professors started within the department in September- 2022, replacing two of our members who retired during the prior year. These instructors have quickly on-boarded, and the

department is appreciating their perspective on the first-year physics (algebra- and calculus-based) instruction and the attached labs.

- Within the department, a new technician supporting both the IETD and Engineering Transfer program was also hired and started September-2022.
- Increased number of no-class days in the Fall is impacting schedules, particularly the lab. Adjusting start/end dates, "flex" days, and other options are all being considered in those years when Monday sessions are particularly impacted.

"Stream" Activities

Astronomy

- ASTR 111 was notably below its typical enrolment; ASTR 112 was closer to historical levels. Both 312 and 311 were slightly down from typical years (normally at or above 30)
- Observed an increased number of no-shows in both terms (i.e. those who enroll but then do not attend and/or "disappear" after a week or two). Sporadic attendance is also higher than what has been seen historically, but seems to be a trend post-COVID.
- In person observing sessions has returned (first sessions since COVID); fall sessions were well received and attended, while weather in the spring has been fairly poor for observing.
- Participated in Nanaimo Science's half day outreach event at a local mall, primary for families with younger kids.

Physics

- Students were better at getting assigned work done than the last few years, especially with the labs.
- Written instructions seem to be a challenge.

• Overall students adapted to the online learning platform quickly – note that VIU is using the D2L Brightspace platform, which is that same platform chosen by the BC Ministry of Education for their LMS.

https://www2.gov.bc.ca/gov/content/education-training/k-12/administration/program- management/online-learning

- Students were more likely to stay home when sick, which, although good, did require more make-up tests and labs.
- Students are more likely to have a tablet available for their learning, and approximately 1/3rd currently use tablets to complete worksheets during lectures.

Yukon University

Jaclyn Semple	Yukon University	jsemple@yukonu.ca

- No information added at the meeting as Jaclyn was not present for the second year in a row. Nothing has been heard from them.
- Jennifer commits to a phone call and to contact the administration at Yukon U.



Yukon University Articulation Report May 2022

https://www.yukonu.ca/about-us/our-history

Yukon University traces its history to the founding in 1963 of the Whitehorse Vocational and Technical Training Centre (soon after renamed the Yukon Vocation and Training Centre), located on the banks of the Yukon River in downtown Whitehorse. College status was granted in the spring of 1983 when the Yukon Vocational and Technical Training Centre became Yukon College, and in 1988 the Whitehorse campus moved from downtown to its current location, 2 km up the hill.

In the spring of 2020 Yukon College was granted university status and all thirteen campuses were renamed Yukon University. The main campus in Whitehorse was officially opened with a potlatch in October 1988, at which the institution was given to the people of the Yukon. First Nations people of the territory were represented by Mrs. Angela Sidney and Mr. George Dawson.

Acknowledging that we live and work in the traditional territory of the Kwanlin Dün First Nation and the Ta'an Kwäch'än Council. 500 University Drive, PO Box 2799 Whitehorse, Yukon Y1A 5K4 (867) 668-8800 or 1-800-661-0504 https://www.yukonu.ca/