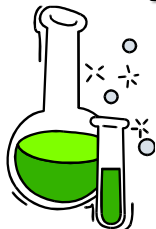


Spring 2022



CHM 152(28633)

General Chemistry II



INSTRUCTOR: Dr. Paul Gilletti

EMAIL: gilletti@mesacc.edu

OFFICE: Building 15 PS-209

PHONE: Office 480.461-7685

Web Page: <https://gillettichemistry.com> (Many of my Powerpoint presentations and old quizzes and exams are available)

****All information here is subject to change as needed or required.**

As per MCCCDD rules, you are required to wear a mask in any building on any campus.

Office Hrs: Virtual by email appointments. Monday: **11:00-11:50 live in PS225** and **virtual 2:00-2:50 appointment required**, Tuesday 1:30-2:30 virtual or in person, Wednesday 2:30-3:30 virtual, Thursday 1:30-2:30, **Friday (appointment only).**

To make an appointment, email me through canvas at paudy84101@mesacc.edu. Please indicate your questions and/or problems and times during which you will be available. If possible, a screenshot of your question may help. I will respond as soon as possible with an appointment. Conferences can then be setup **On-line (Webex or Zoom).**

REQUIRED TEXT: The book we will use is **free online** at:

<https://openstax.org/details/books/chemistry-2e> Click on the Chemistry 2e book (not the one that says atoms first). If you wish, a hard copy can be ordered for around \$53. We will cover chapters 12-17 and 21. If time permits we will cover other topics.

I will always assume that you READ the material, but I won't assume you will understand everything you read. I will try to clarify the material, but reading is a very important part of becoming educated and preparing you for your career.

A Calculator with scientific notation (log, ln, x^y) is also required.

The lecture classes will be in person. **Your attendance is expected.** (I may also try to record and post each class session in canvas announcements.)

Web Page: <https://gillettichemistry.com> (Many of my Powerpoint presentations, assignments and old quizzes and exams are available)

Computer requirements: To get information about the minimum requirements for the computer set up and access some helpful resources and tips to help you get prepared for an online class, please follow this link: <https://www.mesacc.edu/online/get-started>

OFFICE 365 is available as a free download with your student ID number and it contains the full version of excel, Word, and PowerPoint. To download Office 365 start on this link: https://mesacc.edusupportcenter.com/sims/helpcenter/common/layout/SelfhelpArticleView.seam?inst_name=mesa&article_id=1796-1327417 There are versions for Windows and Macs.

Logger Pro 3.15 Downloads (Graphing software)

Windows: <http://www.vernier.com/d/eims3>

Macs: <http://www.vernier.com/d/lrwmf>

Tutoring:

The Learning Enhancement Center (LEC) is excited to inform you that tutoring services will resume on campus this semester! We will offer both in-person (**by appointment**) and online (drop-in) tutoring. You can access all information regarding our services and schedules at our website, www.mesacc.edu/students/tutoring.

Virtual Online Tutoring:

For students who are unable to use our on-campus services, our [Virtual Tutoring Center](#) will **continue to offer** drop-in tutoring (so no appointment is necessary!). Our online tutoring is conducted through Cranium Cafe, where students can have video meetings and instant chats with tutors, upload and collaborate on documents, and organize your thoughts with a virtual whiteboard. To meet with a tutor in the Virtual Tutoring Center, visit <https://www.mesacc.edu/online-tutoring>. Additional Online Tutoring is available for all MCC students through Brainfuse (24/7 availability). Students are limited to 10 hours of online tutoring per semester using this platform.

On-Campus Tutoring

For those who are on campus, we highly encourage making use of our **in-person appointments**, as they provide face-to-face tutoring in safe learning spaces. Appointments for in-person tutoring will be available beginning August 23. All appointment slots are 25 minutes, unless otherwise noted by the center. Students can book a second appointment immediately after concluding a tutoring session. To book a tutoring appointment, visit <https://tutortraclec.mesacc.edu> and follow the prompts on the screen. Instructions are also attached to this email.

Locations, student resources, and some appointment procedures vary by center. Please note these specific details as you book your appointment with the center that meets your tutoring needs.

At times, you will participate in the course using Canvas learning management system. To log into Canvas go to the MCC webpage, click on the Canvas tab, and log in using your MEID and password. **You must provide the same first and last name in Canvas as the one on the official class roster in SIS. NO NICKNAMES OR PSEUDONYMS!** Check out this [Canvas Tutorial](#) to get familiar with the platform.

Canvas download to upload assignments: Some of your assignments must be scanned and uploaded into canvas. I prefer them as single files, either Word documents or scanned pdf files. If you download a free scanning app such as Adobe Scan on your smart phone, you can scan a document using your phone's camera in pdf format (you must put multiple pages in **one** document by using the continue button and scanning the next page(s)). Then after naming and saving the file, you can upload it using the canvas app directly into canvas. In the app store for your cell phone, there is a free **Canvas** app that can be linked to your canvas account through your cell phone. This app makes uploading a file easy.

NETIQUETTE: It is important to understand how to interact with one another online, netiquette. You can read more about it here [Rules of Netiquette](#).

Statement of Student Responsibility: As a registered student in this class, it's your responsibility to know and understand the contents of this syllabus. Ask if you have any questions! Every student attending Mesa Community College is expected to know and comply with all current published policies, rules, and regulations as printed in the college catalog, class schedule, and/or [MCC 2020-2021 Student Handbook](#)

Additional note: I will try to record and post each class session on Webex or Zoom, but attendance in person is expected.

I plan on giving most of the exams and quizzes during the regularly scheduled class times. I will usually announce the quiz times one class session before the quiz. I will announce exams one week in advance. Some of the assignments and quizzes will have to be worked out on paper and scanned in pdf format to upload in canvas. Refer to the canvas app mentioned above.

CELL PHONES: May not be used for the class or for quizzes and should not be used in class.

Below are listing for practice tests and quizzes on the internet (different books):

Silberberg Book (4th edition): This site provides practice quizzes that are graded online and other learning aides:

http://highered.mcgraw-hill.com/sites/0072396814/student_view0/index.html This site will show:

Chem 161 textbook website – Bad Request – McGraw-Hill Education. If you click on this statement, it will take you to the book site. Once there, you may select chapters and practice quizzes.

9th Ed of Brown and Lemay. This contains practice quizzes and exams that are graded online. It is good practice for quizzes and exams.

http://wps.prenhall.com/esm_brown_chemistry_9/1,4647,169060,.html

PREREQUISITES: Completion of CHM 151, CHM151LL (Preferably within the last year) and MAT 151 or higher with a "C" or better.

ATTENDANCE: Attendance will be taken each class period and a withdrawal (W/Y) **MAY** be initiated after four absences. Withdrawal from class is the student's responsibility. See the

current Mesa Community College catalog and paragraph below for withdrawal procedures. If you do not take the final exam, you will be given a withdrawal.

STUDY HABITS AND WORK ETHIC: This class is a big step up from CHM 151. It requires a great deal of time to master the material covered in this course. Students who attend class regularly and work homework problems have a much greater success rate. It is strongly suggested that you study a minimum of THREE HOURS for every lecture hour. If your background is weak, you should plan on spending more time. **DO NOT GET BEHIND. I also recommend forming study groups, which can be done online with zoom, webex or some other platform.** Please contact me if you are having difficulty or get tutoring. See Virtual Online Tutoring near the beginning of this document.

ACADEMIC DISHONESTY POLICY: See the current MCCD student handbook on the academic dishonesty policy. Academic dishonesty may include: representation of the work of other's as one's own, use of unauthorized assistance in academic work, failure to cite sources used, copying the work of another student on any form of a test, helping others cheat, etc. Repercussions can be found in the student handbook and range from a warning to dismissal from the course with a failing grade.

WITHDRAWAL: See your student schedule in *my.maricopa.edu* for the Last Day to Withdraw without an Instructor Signature for each class in which you are enrolled (This is the first seven weeks from when the class started). After that time your instructor's signature is required. (Refer to the Important Deadlines for Students to determine the Last Day Student Initiated Withdrawal will be accepted.) . Either a withdrawal passing (W) or a withdrawal failing (Y) may be given, based upon student performance***.

Information for Students with Disabilities: If you have a documented disability, including a learning disability, and would like to discuss possible accommodations, please contact the MCC Disabilities Resources and Services Office at [480-461-7447](tel:480-461-7447) or email drsfrontdesk@mesacc.edu.

Students with disabilities must have an equally effective and equivalent educational opportunity as those students without disabilities. Students experiencing difficulty accessing course materials because of a disability are expected to contact the course instructor so that a solution can be found that provides all students equal access to course materials and technology.

Information for Pregnant or Parenting Students: If you are a pregnant or parenting student you are protected under Title IX regarding classroom accommodations. Please request your accommodations through the MCC Disabilities Resources and Services Office at [480-461-7447](tel:480-461-7447) or email drsfrontdesk@mesacc.edu.

Mandatory DRS and Title IX Syllabus Statements:

The following link will take you to the MCCCDD district policy statements.

<https://district.maricopa.edu/mandatory-drs-title-ix-syllabus-statements>

EARS (Early Alert Referral System)

MCC Early Alert Program (EARS)

Mesa Community College is committed to the success of all our students. Numerous campus support services are available throughout your academic journey to assist you in achieving your educational goals. MCC has adopted an Early Alert Referral System (EARS) as part of a student success initiative to aid students in their educational pursuits. Faculty and Staff participate by alerting and referring students to campus services for added support. Students may receive a follow up call from various campus services as a result of being referred to EARS. Students are encouraged to participate, but these services are optional.

Early Alert Web Page with Campus Resource Information can be located at:

<http://www.mesacc.edu/students/ears> or locate the "Early Alert" selection at the "mymcc" link from MCC's home page.

DATES:

MLK Day Monday, January 17.....NO CLASS

Presidents' Day Monday Feb 21.....NO CLASS

Spring Break March 14-20.....NO CLASS

LAST DAY OF CLASSES: May 8

FINAL EXAM: MW 9:00 a.m. class...Monday, May 9.....9:00-10:50 am Comprehensive.

GRADING POLICY:

HOMEWORK: 4 bonus points will be awarded for each chapter (details are provided in the

homework assignment document). I strongly suggest you keep a spiral notebook to work the assigned end of the chapter problems. The problems I have assigned have answers at end of the book to allow you to check your answers. The problems should be worked in organized detail to provide you with a study guide in preparation for quizzes and exams. You should work homework **at the pace of the class** to be well prepared. Homework improves knowledge retention and improves scores.

I will give at least 8 quizzes worth 50 points each and will keep your best 7 scores. I will usually announce a quiz on period in advance. Most will be taken in class.

Other quizzes must be printed, worked out showing all work and then scanned as pdf files and uploaded to canvas. There are many free pdf scanning apps for cell phones. More details will be provided in canvas.

A midterm over 3 chapters (kinetics, chemical equilibrium, and acid base chemistry), 150 points will be given. Date to be announced one week in advance.

Final examination, 200 points (**comprehensive** final).

A	B	C	D	(700 points possible)
90-100%	80-90%	70-80%	60-69%	

NO Quizzes or exams will be given after the scheduled times. Extraordinary circumstances may dictate otherwise.

*** Lab is a separate one-credit (CHM 152LL) course. Unless previously taken, a student must be enrolled in a lab.

COURSE COMPETENCIES: <http://www.dist.maricopa.edu/cgi-bin/cpr.pl?trm=20022&crs=chm152&inst=99>

General Information: (we will cover chapters 12-17 and chapter 21 in the openstax book).

Suggestions for homework: Keep worked problems in a SEPARATE, homework only, thin spiral or stitched composition type. **Write in the starting time (and date) and ending time of each problem working session to help you in "time tracking"**. When working problems you should show as much detail as possible including writing notes to yourself and reference pages so studying at test time becomes a review and your homework notebook is your study guide. You should work problems at the pace of the class. Working the problems that have solutions at the end of the book to allow you to check your answers is suggested.

Hint: When solving problems always determine **what is being asked first** and its units (and if necessary, its place in a formula), then what is given and its units (and if necessary, how it fits in a formula), and finally convert what is given into what is desired to solve the problem.

******key formulas and concepts by chapters******

Chapter on Kinetics

Order in [A]	Rate Law*	Integrated Rate Law y = mx + b form	Linear Graph ? vs t	Slope of Line Equals	Half life Equations
0	rate = k	$[A]_t = -kt + [A]_0$	$[A]_t$	-k	$t_{1/2} = [A]_0/2k$
1	rate = k[A]	$\ln[A]_t = -kt + \ln[A]_0$	$\ln[A]_t$	-k	$t_{1/2} = 0.693/k$
2	rate = k[A] ²	$1/[A]_t = kt + 1/[A]_0$	$1/[A]_t$	k	$t_{1/2} = 1/k[A]_0$

*Since the units of rate are concentration/time, the units of k (the rate constant) must dimensionally agree. So for each order, k will have different units and these units can be used to tell one which equation to use. A [] means the concentration of the enclosed species.

Arrhenius Equation:

logarithmic form (used in graphing to find E_a): $\ln k = \ln A + [(-E_a/R) (1/T)]$

note: form is $y = b + mx$ where $y = \ln k$, $m = -E_a/R$, $x = 1/T$, and $b = \ln A$ so a plot of $\ln k$ against $1/T$ would be a straight line with the slope = $-E_a/R$.

Two Point form: $\ln(k_2/k_1) = (E_a/R)(1/T_1 - 1/T_2)$ using this form, a rate constant can be calculated at different temperatures. *Note: there are different forms of this equation which are derived by different algebraic manipulations.

Chemical Equilibrium.

For reaction: $aA + bB \rightleftharpoons cC + dD$

$K_c = \frac{[C]^c[D]^d}{[A]^a[B]^b}$ "products raised to their coefficients over reactants raised to their coefficients" Solids (and water in high concentrations) are ignored.

$Q = \frac{[C]^c[D]^d}{[A]^a[B]^b}$



Capital K is the equilibrium constant .

Capital Q is the reaction quotient. At equilibrium $Q = K$.

We also have a K_p which is often used for gases. Instead of Molarity, [], the gas concentrations are expressed as their pressure. $K_p = K_c(RT)^{\Delta n}$ where "delta n" is the change in moles of gas in the reaction.

If two or more reactions can be summed up to give a third reaction, then the equilibrium constant for that reaction is the product of the equilibrium constants of those reactions.

It is often helpful to use an I.C.E. (initial, change, equilibrium) chart in setting up and solving problems.

*****Be sure to read and study **Le Chatelier's principle**.

Acids and Bases:

(Seven Strong Acids: HClO_4 , HClO_3 , H_2SO_4 , HI , HBr , HCl , HNO_3 [the corresponding Br and I oxyacids are also strong]). All the other acids will be considered weak acids unless otherwise stated.

Strong Bases: Group 1 and Group II from Ca(OH)_2 on down. (There are stronger bases about which you will learn in organic chemistry.)

KEY EQUATIONS: (Page 702)

$[\text{H}^+][\text{OH}^-] = K_w = 1.0 \times 10^{-14}$ at 25°C , but value changes with temperature.

$\text{pH} = -\log[\text{H}^+]$ **note this is log base 10, not natural log.**

$\text{pOH} = -\log[\text{OH}^-]$

$\text{pH} + \text{pOH} = 14$ @ 25°C

For weak acids and bases:

$K_a = \frac{[\text{H}^+][\text{A}^-]}{[\text{HA}]}$ or $\frac{[\text{H}_3\text{O}^+][\text{A}^-]}{[\text{HA}]}$

$K_b = \frac{[\text{HB}^+][\text{OH}^-]}{[\text{B}]}$

Also: $K_a K_b = K_w = 1 \times 10^{-14}$ @ 25°C

Chapter 16: Acid-Base Equilibria and Solubility Equilibria.

(Seven Strong Acids: HClO_4 , HClO_3 , H_2SO_4 , HI , HBr , HCl , HNO_3 (analogous acids HBrO_4 , HIO_4 , HBrO_3 , and HIO_3 are also strong)). All the other acids will be considered weak acids unless otherwise stated.

Strong Bases: Group 1 and Group II from Ca(OH)_2 on down. (There are stronger bases about which you will learn in organic chemistry.)

Henderson-Hasselbach equation: $\text{pH} = \text{p}K_a + \log \frac{[\text{conj. base}]}{[\text{acid}]}$

Try deriving an equivalent $\text{pOH} =$ expression from $K_b = \frac{[\text{conj. acid}][\text{OH}^-]}{[\text{base}]}$

Entropy, Free Energy, and Equilibrium *Be sure to Review the earlier Chapter on Thermochemistry*

Summary:

$$\Delta U = q + w \text{ (some books use } \Delta E = q + w)$$

ΔH = negative, favors spontaneity

ΔH = positive, favors non-spontaneity

$$\Delta H = H_{\text{final}} - H_{\text{initial}}$$

$$\Delta H = H(\text{products}) - H(\text{reactants})$$

$$\Delta H_{\text{rxn}}^{\circ} = \sum m\Delta H_f^{\circ}(\text{products}) - \sum n\Delta H_f^{\circ}(\text{reactants})$$

ΔS = positive, favors spontaneity

ΔS = negative, favors non-spontaneity

reversible process: $\Delta S_{\text{universe}} = 0$

Irreversible process: $\Delta S_{\text{universe}} > 0$

$$\Delta S = q_{\text{rev}}/T \text{ (@ constant T)}$$

$$\Delta S = \Delta H_{\text{vap}}/T_{\text{boiling}}$$

$$\Delta S^{\circ} = \sum m\Delta S_f^{\circ}(\text{products}) - \sum n\Delta S_f^{\circ}(\text{reactants})$$

ΔG = negative, the reaction is spontaneous in the forward direction.

ΔG = zero, the reaction is at equilibrium.

ΔG = positive, the reaction in the forward direction is nonspontaneous and work must be supplied from the surroundings to make it occur. However, the reverse reaction will be spontaneous.

$$G = H - TS \quad (\text{relate this formula to table 19.4 on page 735})$$

$$\Delta G = \Delta H - T\Delta S$$

$$\Delta G^{\circ} = \sum m\Delta G_f^{\circ}(\text{products}) - \sum n\Delta G_f^{\circ}(\text{reactants})$$

$$\Delta G = \Delta G^{\circ} + RT \ln Q \quad \text{@equilibrium } \Delta G = 0 \text{ so } \Delta G^{\circ} = -RT \ln K$$

ΔG° negative: $K > 1$ (the more negative ΔG° , the larger the value of $K_{\text{equilibrium}}$)

ΔG° zero: $K = 1$

ΔG° positive: $K < 1$

Electrochemistry

$$A = C/s \quad J = V \cdot C \quad F = 9.65 \times 10^4 \text{ C/mole (of } e^-) = 9.65 \times 10^4 \text{ J/V} \cdot \text{mole (of } e^-)$$

$$1 \text{ V} = 1 \text{ J/C} \quad R = 8.314 \text{ J/mol} \cdot \text{K}$$

$E^{\circ} = E^{\circ}_{\text{ox}} + E^{\circ}_{\text{red}}$ (a positive value is spontaneous) note: this is a different equation than that found in your book

$$\Delta G = -nFE \quad \Delta G = -nFE^{\circ}$$

$$\text{Nerst Equation : } E = E^{\circ} - \frac{RT}{nF} \ln Q \quad \text{or @ } 25^{\circ} \text{C} \quad E = E^{\circ} - \frac{0.0257}{n} \ln Q$$

$$\ln K = \frac{nE^\circ}{0.0257} \text{ @ } 25^\circ \text{C}$$

Nuclear Chemistry

NOTE: Nuclear decay is just first order kinetics. The formulas below are really the same as the formulas for 1st order kinetics. The variables are changed from $[A]_0$ and $[A]_t$ to N_0 and N_t and the equations have been rearranged.

$$\ln \frac{N_t}{N_0} = -kt \quad \text{or} \quad \ln N_t = -kt + \ln N_0 \quad \text{and} \quad k = \frac{\ln 2}{t_{1/2}} = \frac{0.693}{t_{1/2}}$$
$$\ln N_t = -\lambda t + \ln N_0 \quad \lambda = \frac{\ln 2}{t_{1/2}} = \frac{0.693}{t_{1/2}}$$

PERIODIC TABLE OF THE ELEMENTS

1A																	8A
1 H 1.008	2A											3A	4A	5A	6A	7A	2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31	3B	4B	5B	6B	7B	8B		1B	2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95	
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 181.0	74 W 183.8	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.0	89 Ac 227.0	104 Unq (261)	105 Unp (262)	106 Unh (263)	107 Uns (262)	108 Uno (265)	109 Une (266)									

58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np 237.0	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)

Student Study Schedule

Use this schedule to plan your week. Schedule chemistry and other classes or labs. Allow two to three study hours between each chemistry lecture before the next lecture occurs. Allow study time for all classes and labs. Then include work, travel time, family time, meals, sleep, exercise, etc. Remember you NEED SLEEP.

Time	Monday	Tuesday	Wednesday	Thursday	Friday
5-6					
6-7					
7-8					
8-9					
9-10					
10-11					
11-12					
12-1					
1-2					
2-3					
3-4					
4-5					
5-6					
6-7					
7-8					
8-9					
9-10					
10-11					
11-12					

WEEKEND STUDY TIMES. DON'T WASTE FRIDAY AFTERNOON AND EVENING AS WELL AS SATURDAY AND SUNDAY.

CHEMISTRY INFORMATION

Please complete this page and return via canvas by the time of the next class meeting.

Semester: Spring Year: 2022 Course: CHM152 Section: 28633

Name: _____ Phone: _____

e-mail: _____

Major **and** CAREER Goal*: _____

Number of Hours You Are Working per Week (Please consider family responsibilities and volunteer hours when considering your course load below): _____

Number of Credit Hours You are Taking: _____

Previous <u>Chemistry</u> Courses Taken:	<u>Date Taken</u>	<u>Name and/or Location of School</u>
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High School Course(s): _____	_____	_____
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_____	_____	_____
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College Chemistry Course(s): _____	_____	_____
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_____	_____	_____
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Highest Level Math you have completed: _____

Math Currently being taken: _____

Future Chemistry courses that you are planning to take at MCC:

Write a brief statement detailing the combination of work ethic, ability, time commitment, and grades that are required to succeed in the major and career goal that you listed above.

I have received the syllabus and am responsible for its content _____ (signature)