



Estd 1864

Forman Christian College, Lahore
(A Chartered University)
Department of Mathematics

Instructor Information:

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Professor of Mathematics
Ph.D. (University of Glasgow, Scotland, U.K., 1999),
M.Phil. (Quaid-i-Azam University Islamabad, 1995)
M.Sc. (Quaid-i-Azam University Islamabad, 1993)

Office: S 356 Armacost (Science) Building

Office Hours: 03:15 PM to 04:15 PM (Monday), 11:10 AM to 12:10 PM (Thursday)

The students not on campus could contact via **WHATSAPP: CONTINUUM MECHANICS GROUP** preferably during the same office hours.

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Course Information: (**COURSE TRAILER LINK:** https://youtu.be/8wshl_YJ3JM)

Title: Continuum Mechanics **Code:** Math 409 **Credits:** 4

Prerequisite: Math 203 (Vector Analysis) & Math 209 (Linear Algebra)

Class Room: S-413

Class Discussion Time: Monday and Wednesday (12:00 PM - 01:15 PM)
Friday (12:00 PM- 12:50 PM)

Text Book: *Nonlinear Solid Mechanics*, A Continuum Approach for Engineering, by Gerhard A. Holzapfel (2000), First Edition, (Publisher: John Wiley & Sons).

Course Description:

At the *microscopic level* matter is discontinuous. It is composed of molecules and atoms. However, in real life we are concerned with volumes of matter with dimensions large compared with these particles. **CONTINUUM MECHANICS** deals with the behavior of bodies of solids and fluid matter on a *macroscopic scale*. It disregards the microscopic structure and treats matter as being smoothly distributed throughout the body under consideration.

Learning Outcomes:

At the end of the course students must know:

1. The basic theoretical ideas in continuum mechanics using the theory of **CARTESIAN TENSORS**.
2. How to apply the theory in the solution of different types of problems in *nonlinear Elasticity*?
3. How to develop *research interests* in different fields of non-linear elasticity?

Course Requirements:

Students must arrive at class on time and **those coming after 15 minutes won't be allowed** unless there was an emergency and instructor was informed before the class. If there is a genuine reason for coming late and **not possible to inform the instructor then please stay outside**, class discussion could be done during office hours or by an appointment. **Inside the class room Mobile phones will be turned off and no one will sleep.**

According to the instructions from the higher authorities and COVID-19 situation we are going to **follow BASIC blended model (FLIPPED CLASSROOM)** in which we have **face-to-face sessions** that are **complimented** with **online material/activities**. All the students will watch **videos (My Online YOUTUBE LECTURES)** on **WEEKLY BASIS** available at: https://www.youtube.com/c/DrWasiqMathematicsUndergraduateLecturesMULTIMEDIA?sub_confirmation=1 in the **PLAYLIST "CONTINUUM MECHANICS"**.

Then we shall use class-time for discussions and questions.

YouTube RECORDED Multimedia Lectures have been prepared with **full detailed calculations** using **power-point presentations** with **animations**. All the students **MUST WATCH EVERY LECTURE** on **weekly basis** before attending the **face to face class discussion** or **online discussion**.

In my course **ATTENDANCE** is **NOT Compulsory** for **Class discussions** but it is **strongly recommended** to **attend class sessions** for **discussions** and **questions** after **watching the online lecture seriously**. **Online lecture** could be **watched more than once** and you **definitely find it useful**.

Working regularly, understanding **the online lectures, solving problem sets, doing assignments (to be graded)** will be very helpful to get an overall good grade. **IN FACT IT IS VERY IMPORTANT TO CONCENTRATE ON GETTING THE KNOWLEDGE NOT JUST THE GRADE.**

You are most welcome to discuss the assignments (to be graded) with me (after seriously attempting) but NO CHEATING/COPYING as **THREE CHEATING OFFENCES** are still applicable. **ONLY SOFT COPIES** of **ASSIGNMENTS** will be acceptable. **GRADED ASSIGNMENTS** should be submitted via **MOODLE** or **EMAIL**. I understand that this is really a difficult time but **LATE SUBMISSION** may **RESULTS** in **GRADE REDUCTION** so **PLEASE COOPERATE** and **AVOID LATE SUBMISSION**.

(Read Student handbook Pages 25-27 available at <http://www.fccollege.edu.pk/wp-content/uploads/2012/09/Final-Bacc-Handbook-2012.pdf>), following are the **consequences** for **cheating**:

First offence: a grade of zero will be assigned to the paper, report, quiz or test. The student's final grade for the class must be reduced by *at least* one letter grade. **Case will be reported to Vice Rector.**

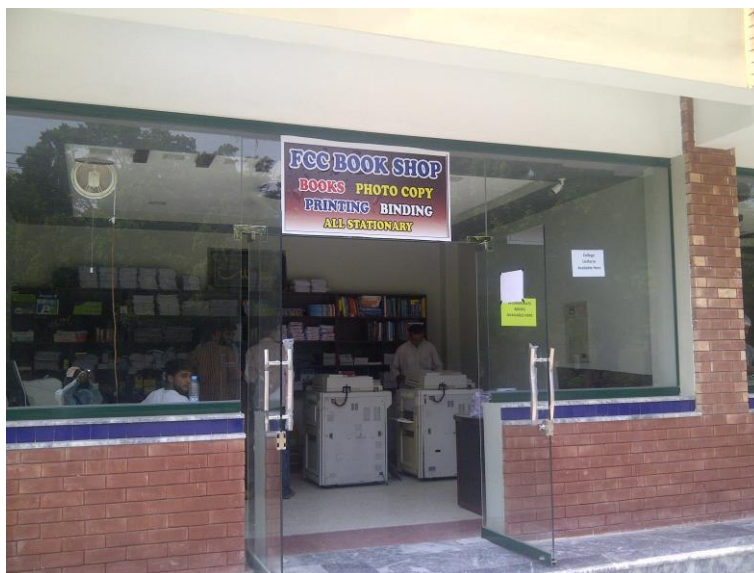
Second offence: an automatic dismissal from the course in which the second offence occurred with a resulting final grade of "F". **Case will be reported to Vice Rector.**

Third offence: the student will be called before an Academic Integrity Committee to show cause why the University should not suspend him or her. The Vice-Rector will convene such a hearing. **First offence in another course will be overall 3rd offence, as two already recorded before that.**

Technical Facilities:

Teaching will be done with the help of **RECORDED COLORFUL MULTIMEDIA RECORDED YOUTUBE LECTURES**, for which, **important updates** will be **shared via Whatsapp and MOODLE**. **DUE TO COVID-19 SITUATION BUT BEARING IN MIND SAFETY MEASURES** **HARD COPIES** of Lectures and Problems Sets' Solutions **COULD BE OBTAINED FROM FCC BOOKSHOP**.

See the Picture of the bookshop:



Course Evaluation:

Grading will be based on following criteria (**PROVIDED WE THROUGHOUT FOLLOW THE BLENDED MODE**):

3 Assignments (20% each on MOODLE or EMAIL) 60%

VIDEO ASSIGNMENT/PRESENTATION (RECORDED IN YOUR VOICE)

Duration: At least 10 Minutes

(Submit on MOODLE or via GOOGLE DRIVE) 40%

Guidelines to do recording on MICROSOFT power-point 2010: (Procedure may vary in other versions)

- (1) Open PowerPoint Presentation
- (2) Click "FILE".
- (3) Click "Save and Send"
- (4) Click "Create Video"
- (5) DON'T click "Don't Use Record Timings and Narrations"
- (6) Click "Record timing and Narration" and "START RECORDING".
- (7) Once the lecture is complete press "ENTER".
- (8) Click "Use Recorded Timings and Narrations" and click "PREVIEW".
- (9) If "PREVIEW" is correct then stop which means CLICK "X" and do step "4" and click "Create Video" and save with a different name.
- (10) Don't save the actual file (which was made on power-point).

IMPORTANT NOTES:

- (1) Never go back to previous slide otherwise recording of previous slide disappears.
- (2) Don't speak at the change of slide or going to next slide.
- (3) LASER POINTER: CTRL+LEFT MOUSE CLICK
- (4) LASER POINTER STOPS as SLIDE CHANGES.

MORE GUIDE-LINES to make the Presentation Understandable:

- (1) Information must be presented in a logical sequence.
- (2) Introduction is attention-getting, lays out the problem well, and establishes a framework (structure) for the rest of the presentation.
- (3) Presentation contains accurate information and must be communicated using correct vocabulary and grammar.
- (4) Voice must be clear and audible.
- (5) Delivery must be poised (balanced), controlled, and smooth.

- (6) Good language skills and pronunciation should be used.
- (7) Visual aids are well prepared, informative, effective, and not distracting.
- (8) Length of presentation should be within the assigned time limits.
- (9) Presentation guarantees that the student clearly understands the topic in-depth and presented his/her information convincingly.
- (10) Video must be edited effectively.

NOTE: Power-point presentation could also be recorded on other soft-wares like ZOOM.

<u>Grades</u>	<u>Quality Points</u>	<u>Numerical Value</u>	<u>Meaning</u>
A	4.00	93-100	Superior
A-	3.70	90-92	
B+	3.30	87-89	
B	3.00	83-86	Good
B-	2.70	80-82	
C+	2.30	77-79	
C	2.00	73-76	Satisfactory
C-	1.70	70-72	
D+	1.30	67-69	
D	1.00	60-66	Passing
F	0.00	59 or below	Failing

WEEKLY SCHEDULE

Week/Weeks (Starting Date)		Reading Material from Book
(1) 1st NOV.	1) Discussion of Course Plan 2) Algebra of vectors	Pages: 1 - 9

(2) 8 th NOV.	Transformation Laws for Basis Vectors and Components	Pages: 28 - 30
(3) 15 th NOV.	Transformation Laws for Basis Vectors and Components ASSIGNMENT NO. 1 (DUE DATE: 12th DEC.)	Pages: 31 - 32
(4) 22 nd NOV.	Algebra of Tensors	Pages: 09 - 14
(5) 29 th NOV.	Algebra of Tensors	Pages: 15-20
(6) 6 th DEC.	Eigenvalues, Eigenvectors of Tensors	Pages: 24-27
(7) 13 th DEC.	Configurations, and Motions of Continuum Bodies ASSIGNMENT NO. 2 (DUE DATE: 16th JAN.)	Pages: 56-60
(8) 20th DEC.	1) Displacement, Velocity, Acceleration Fields. 2) Gradients and Related Operators (<i>from Chapter 1</i>).	Pages: 61-64 Pages: 44-51
(9) 3 rd JAN.	Material Derivatives	Pages: 64-66

(10) 10 th JAN.	Spatial Derivatives	Pages: 67-69
(11) 17 th JAN.	Deformation Gradient ASSIGNMENT NO. 3 (DUE DATE: 13th FEB.)	Pages: 70-76
(12) 24 th JAN.	Strain Tensors	Pages: 76-80
(13) 31 st JAN.	Strain Tensors	Pages: 81-84
(14) 7 th FEB.	Rotation and Stretch Tensors	Pages: 85-90
(15) 14 th FEB.	Simple Shear Deformation	Pages: 91-92
(16) 21 st FEB.	Final exams/assessments start. Date will be announced later.	

One More Facility: “10 COURSE PACKS” have been made available in the Library, which students can issue for 5 days, which contains all the selected pages of your text book which are indicated in the 15 weeks schedule.