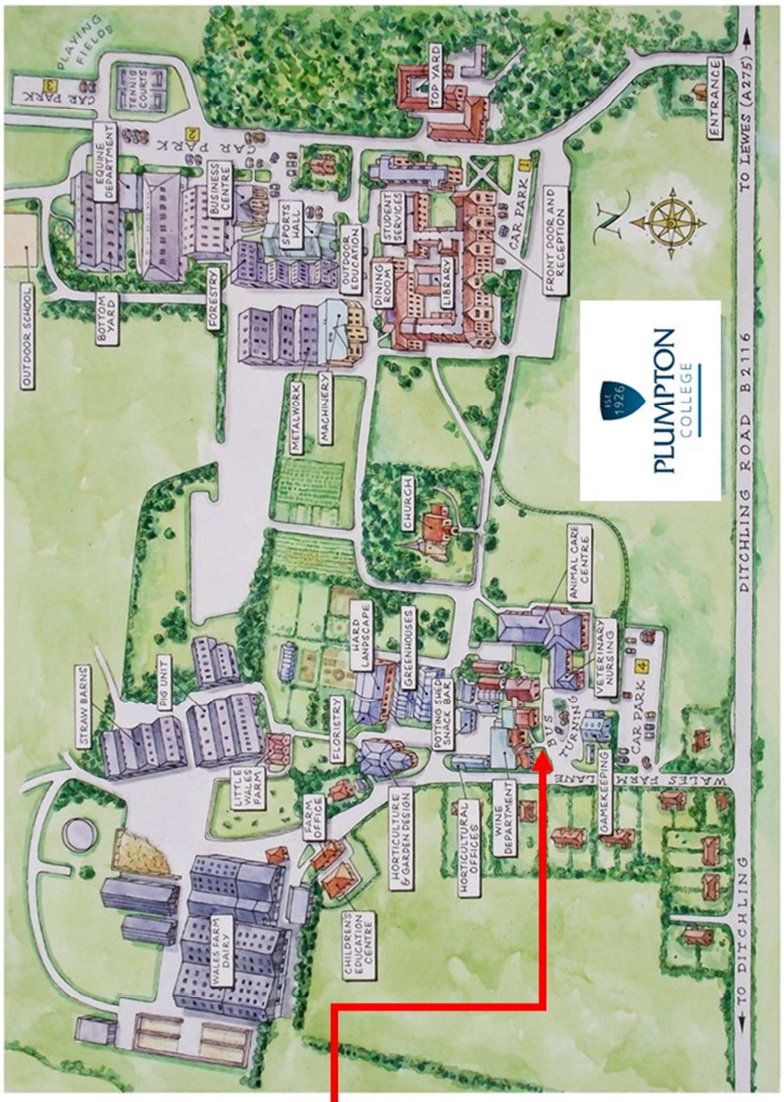
WineSkills
Principles of Sparkling Wine

Course Handbook
and Student Notes

April 2023

Name: _____

Maps of the College Estate and Main Building



Please arrive at the Wine centre.

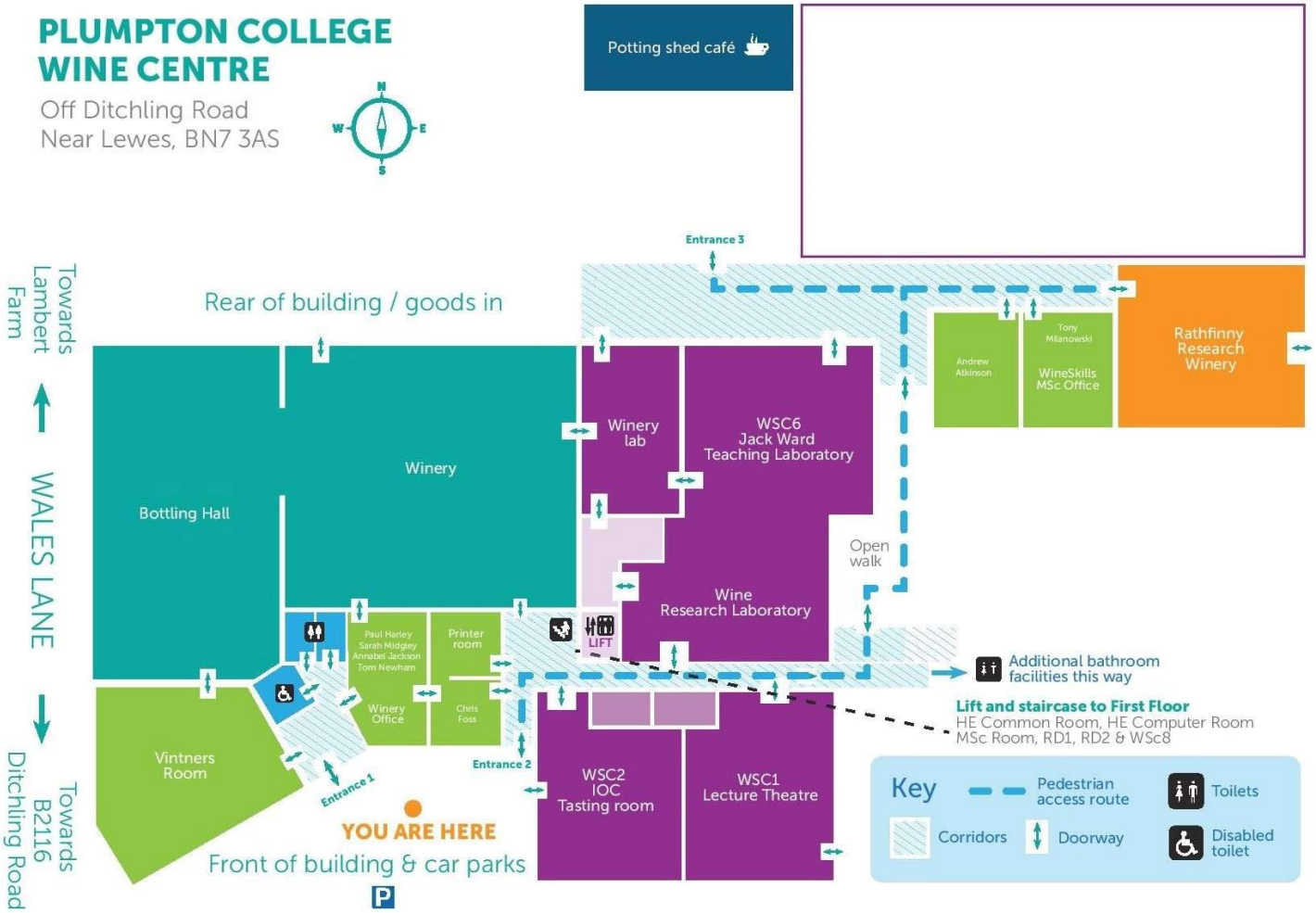
Parking is available in front of the wine building.

Follow the signs posted.

For those using Sat Nav please use the postcode
BN7 3AS
Wales Lane

PLUMPTON COLLEGE WINE CENTRE

Off Ditchling Road
Near Lewes, BN7 3AS



Course outcomes:
(By the end of the course, the student should be able to :)
Sparkling Wine Production:

- Distinguish between the different methods of sparkling wine production
- Describe the steps required in the production of sparkling wine by the traditional method.
- Identify specific sparkling winemaking equipment, conduct a dosage trial for sparkling wine and disgorge sparkling wine

Recommended reading

Books:
Rankine B (latest edition) *Making good wine* Sun Books (Australia)
Periodicals:
The Australian and New Zealand Vinegrower and Winemaker
Practical Vineyard and Winery
Vineyard Magazine (UK)

Tuesday 11th April
The theory of sparkling wine with Sarah Midgley (class room)
Wednesday 12th April
blending trials, stability testing, preparation of mother culture and tirage with Deepika Koushik (winery)
Thursday 13th April
Dosage trials and calculations and disgorging with Deepika Koushik & Wiston Estate Winery

Wifi details
Network: Plumpton Visitor
Password: Tuesday14$

Sparkling wine production

1. Different methods of sparkling winemaking

Method	Advantages	Disadvantages
Traditional Base wine is bottled with sugar and yeast & secondary fermentation occurs in bottle. Yeast is then removed by riddling and the bottle topped up and sealed with a cork. Widely used for quality sparkling wines e.g. Champagne.	Widely recognised as producing the highest quality product	Expensive in space, time and labour.
Aeration Dissolving carbon dioxide into a base wine in a pressurised tank. Used for the cheapest sparkling wines.	Quick, cheap and easy to perform	Bubbles are large and aggressive No lees contact effect Must be labelled 'aerated' or 'carbonated'
Cuve Close, Bulk or Charmat Sugar and yeast are added to the base wine in a pressurised tank, which may contain agitators to increase yeast contact. After fermentation, the yeast is cooled, clarified, and then bottled under pressure. Widely used, e.g. in Prosecco & German Sekt.	Economies of scale and space. More homogenous product Can produces more 'fruity' wine styles	Less lees contact effect
Transfer method Wine is bottled with yeast and sugar and undergoes secondary fermentation in the bottle. Wine is cooled, bottles decanted into bulk tanks, wine filtered & re-bottled. Used in Australia & USA.	Similar quality to traditional method, but more practical. Product can be labelled 'fermented in a bottle'	Machinery is expensive.

Also:

- Méthode Rurale
- Continuous flow method
- Méthode Dioise
- Asti method

2. The Traditional Method

Used to be called Méthode Champenoise.
Might have been invented by Dom Pérignon or Charles Merret?

Champagne before Méthode Champenoise: 'A thin acidic and uninteresting wine, cheap and consumed locally'

Champagne after Méthode Champenoise: 'A wine in great demand, commanding high to extremely high prices'.

Most important quality factor is linked to yeast autolysis, which affects flavour and bubble stability. Quality traditional Champagne is low in grape flavour which is allows for delicate aromas of autolysis: nuts, toast, and cream.

The wine should show a fine persistent bead of bubbles and a mousse that doesn't collapse immediately but retains a ring. Proteins from yeast autolysis act as surfactants (**surf**ace **act**ive **a**ge**nts**). which form a gas/liquid boundary in the bubble and prevent rapid growth and also slow drainage of wine in foam, thus stabilising foam.

Some traditional method wines such as Cava & some New World styles are more fresh, fruity & easy to drink. The aromas of autolysis can be hidden by the fruit from the grapes. These are generally not worth ageing

2.1 Harvesting

Traditionally, three cultivars are used:

- Chardonnay: acidity, freshness, aging potential
- Pinot Noir: depth, complexity, structure
- Pinot Meunier: fruity flavour

But also Gamay, Pinot Blanc, Riesling, Xarello, Macabeo, Chenin Blanc.

In Champagne, these are harvested at:

Sugar: 60 - 75° Oe
Acidity: 12 - 18 mg/l tartaric
pH: 2.9 – 3.2

But this varies according to the varietal & winemaking method.
Important to avoid herbaceous notes or too much varietal aroma.

Harvesting should be as gentle as possible in order to avoid colour and phenolic extraction
It is always done by hand into small trays (< 50 kg)

2.2 Processing & pressing

Sulphur dioxide is never added to grapes during processing as this would increase phenolic extraction.

No crushing or de-stemming; the grape bunches must be loaded into the press whole in order to have low solids and phenolics and allow for the fractionated extraction of the juice.

The very first juice from the press (known as autorun) is often separated as they contain water, dirt and pesticides.

In Champagne, the juice from a 4 tonne press is separated into:

- Cuvée first 512 l/tonne
- 1° Taille next 102 l/tonne
- 2° Taille next 51 l/tonne

These are kept separate until blending.
If any other juice is extracted, it should not be used in Champagne.

The Cuvée juice is regarded as the highest quality, as it is derived from the intermediate zone of the berry, which is high in sugars and acids, and very low in colour & phenolics.

Either use a traditional Champagne press:

- Manually loaded, crumbled and emptied (very labour intensive).
- Very low solid extraction of 0.2 - 0.4 % (0.6 - 0.8 % with Vaslin-type screw press, 2 - 4 % with crushing)

Or a membrane press:

- Less labour, but can be difficult to load due to small doors
- Comparable solids
- Tank presses can offer better protection against oxidation.

Horizontal screw presses are also used, but the chains and hoops should be removed.

2.3 Must adjustment

Sulphur dioxide is added up to 50 mg/l after pressing.
The juice is then clarified by cold settling or centrifuging, sometimes with pectolytic enzymes and fining agents such as casein/bentonite, gelatin/tannin or carbon (removes colour).

2. 4 First fermentation

- The same yeast as for second alcoholic fermentation (AF) is used to avoid killer factor problems.
- Nutrients and bentonite may be added.
- If temperature is too high (18 - 20°C), AF too rapid & lack finesse
- If temperature is too low (<10°C), wines grassy & herbaceous
- Optimum is 15°C

Many carry out the Malo-Lactic Fermentation (MLF), as this reduces acidity, alters flavour (reduces fruit), and increases stability (MLF in bottle can render almost impossible to riddle).

2. 5 Post-fermentation operations

Filtration should not be too severe as this will affect macromolecules that act as valuable surfactants.

Tartrate stabilisation is very important as the increase in alcohol will increase their instability, and crystals cause gushing. Levels of alcohol should be increased in samples of base wine before stability tests are carried out on them.

Protein stability is not so important, as proteolytic enzymes and mannoproteins are released during yeast autolysis. The use of bentonite will reduce foam quality. Fining agents such as carbon, PVPP, gelatin/tannin, gelatin/keiselsol & casein can be used to modify colour & flavour (esp. phenolics).

Most Champagnes are non-vintage blends of several vintages and varieties.

2. 6 Bottling & secondary fermentation

Before bottling; sugar, yeast, yeast nutrients and adjuvants are added to the wine.

<u>Sugar</u>

20 - 25 g/l in order to produce around 5 - 6 bar pressure. The higher the alcohol level, higher the addition rate.

<u>Yeast</u>

- Must withstand high alcohol level, high pressure, low nutrient status, high acidity, high SO_2 (sulphur dioxide) and still ferment to dryness
- Should not produce off-flavours, such as H_2S (hydrogen sulphide), VA (volatile acidity), ethyl acetate
- Should autolyse rapidly but also agglomerate and flocculate

- Often use around 15 g/hl EC1118 (*S. cerevisiae* var *bayanus*), rehydrated in ten times its own weight of water (37ºC), then double volume with wine every half hour.

Should aim for 2 - 4 x 10^6 viable cells/ml. Higher yeast counts can cause competition for nutrients which causes metabolic deficiencies leading to hydrogen sulphide.

Yeast must be in very good health (high reserves & sterols) and be acclimatised to alcohol and low temperature. Should do viable cell count to check numbers before inoculation.

<u>Yeast nutrients</u>
Up to 200 mg/l diammonium phosphate (DAP)
0.5 mg/l Biotin

<u>Adjuvants</u>
These help the agglomeration and flocculation of yeast and so help riddling.
e.g.: 2-4 g/hl tannin + 1 - 2 g/hl gelatin
2.5 - 5 g/hl bentonite
1 - 5 g/hl alginate

Often difficult to determine how much to add and excessive use will make riddling difficult.

It is important to keep the mixture agitated during bottling in order to keep in suspension.

Second-hand bottle should not be used as these are very risky due to stress fractures.

Bidules are a good idea before crown caps as they aid in disgorging; often combined bidules/crown caps used.

Stainless steel crown caps are rust free but very springy.

The second fermentation (*Prise de Mousse*) temperature has a large effect on quality, especially bubble size. Optimum is 12 - 14ºC.

2. 7 Ageing & yeast autolysis

Autolysis = enzymatic self-destruction.

Most important is the release of flavour components: e.g. benzaldehyde (nutty, toasty), cis- & trans-farnesol (sunflower) & amino acids, proteins and lipids that act as surfactants.

Affected by:

- Percentage alcohol: increases speed of autolysis
- pH: higher pH favours quicker autolysis
- Temperature, higher temperatures cause increased speed, but interfere with natural ageing, so optimum is 10 - 15°C
- Time. Very little autolysis for first few months after AF, then most significant increase in next six months. e.g., wine is 24 % higher in amino acids after 1 year & 26 % after 4 years. After 6 years, there is no further autolytic activity.

2. 8 Riddling & disgorging

Aim of riddling is to help remove the yeast.

Methods:

<u>Pupitres</u>
Shake bottle before loading.
Twist, lift, slight shake, rattle & knock until yeast goes down into neck. Experienced riddlers can do 20 – 30,000 bottles a day.
1 month 'sur pointes' to allow plug to compact.
Labour intensive, skilled and expensive.

<u>Manual Gyro-palettes</u>
Cage mounted on pyramidal base
Cage is turned and bottles moved.

<u>Mechanical gyro-palettes</u>
Bottles loaded into large cages (350 - 4000 bottles) & on to programmed machine.
Much quicker, economical & space saving.

<u>Encapsulated yeast</u>
From Moet & Chandon, Institut Oenotechnique & CIVC
Yeast culture mixed with alginate extruded into calcium phosphate solution which forms beads with semi-permeable membrane.
Problems with leakage & dosing into bottles.

Disgorging was traditionally done '*a la volée'* but now almost always by neck freezing. Either in solution of brine, glycol or calcium chloride at -20°C for 8 - 10 min. Necks must be washed before disgorging

2. 9 Dosage & corking

Dosage (*liqueur d'expedition*) is base wine, sugar, brandy or spirit (max. increase of 0.5 %), plus around 30 mg/l SO_2, meta-tartaric acid and/or sorbic acid.

Corks are composites with 2 or 3 shives of natural cork.
Can be coated with silicon or paraffin wax.
Wire muzzles should be used.

Wines generally need 1 month *'pour le marriage'* to allow flavours to develop.

3. EU Regulations

Definitions:
Sparkling wine:

- Carbon dioxide (CO_2) may come from first or second fermentation, but cannot be injected
- Pressure due to CO_2 must be greater than 3 bar at 20°C
- Actual alcoholic strength (AAS) must be greater than 9.5 %

Quality sparkling wine:

- Pressure > 3.5 bar at 20°C
- AAS > 10 %
- The second Alcoholic Fermentation (AF) & time on lees must be greater than 90 days or 30 days if AF takes place in containers with stirrers.
- The production process must last longer than 6 months if AF takes place in closed containers, or 9 months if AF takes place in bottle

Aerated sparkling wine:

- CO_2 can be partially or wholly added
- AAS > 8.5 %
- Pressure > 3 bar at 20°C

There are also definitions for semi-sparkling wine, semi-sparkling aerated wine, quality sparkling wine produced in a specified region.

The base wine-making regulations are similar to those for still wines, except that:

- The base wines may be acidified up to a maximum of 1.5 g/l
- There is no limit for their de-acidification

- Sweetening or enriching of the base wine is prohibited
- The addition of the tirage liqueur may not increase the total alcoholic strength of the wine by more than 1.5 %.
- The addition of the dosage must not increase the AAS of the wine by more than 0.5 %

Higher education Wine Courses at Plumpton College

Plumpton College is the UK centre of excellence in education, training and research in wine business and production.

The Foundation Degree (FdA) in Wine Business course has been designed specifically for students wishing to develop careers in the wine trade or start their own wine-related business. It combines both practical and theoretical understanding of the wine industry with valuable work experience, including visits to European vineyards.
The course focuses on the wine trade, business skills in wine, and wines of the world modules that correspond to the Wine and Spirit Education Trust (WSET) Diploma syllabus. This allows students to take units of the WSET Diploma as an additional professional qualification during their two years at Plumpton College. A number of modules also develop students' tasting skills.
The proximity of London, one of the key marketplaces for wine in the world, and Plumpton's contacts within the wine trade, provide a good opportunity for keeping up to date with new developments in the world of wine. There will be classes involving guest lecturers from the wine trade.
Successful graduates from this course may be invited to transfer to the BA (Hons) International Wine Business course to gain a full Bachelor's degree.

The three-year full-time BA (Hons) Wine Business, the only course of its kind in the United Kingdom, enables students to develop an in-depth knowledge and critical understanding of key wine business organisations, their management and the changing external environment in which they operate. Alongside modules relating to WSET Levels 3 and 4, the curriculum will prepare students for situations where the exercise of personal responsibility, and decision-making in complex and unpredictable circumstances, are essential. There is also the opportunity to focus on a specific aspect of wine business in the 30-credit Research Project module. Graduates from the BA (Hons) Wine Business course would expect to be applying for management roles at key wine entities in the trade, or be involved in setting up their own wine business.

The two-year full-time FdSc in Wine Production programme, unique in the United Kingdom, has a strong practical focus and involves students in producing Plumpton College's award winning wine using the College's well-equipped commercial vineyard and purpose-built winery. The development of practical skills focuses on viticulture in year 1, such as tractor driving and vineyard management, whilst year 2 focuses on winemaking. Students will also study the relevant science and theory of wine production.
All students complete a period of work experience, which has taken some enterprising students as far as Greece, South Africa and California.
Successful graduates from this course may be invited to transfer to the BSc (Hons) Viticulture & Oenology course to gain a full Bachelor's degree.

The BSc (Hons) Viticulture & Oenology covers wine production and aspects of related biological sciences in considerable depth. Students also complete a major undergraduate research project around a viticultural or oenological topic of their choice. The course is studied over three academic years, with all final year students completing either a vintage winery placement or a summer vineyard placement. Successful graduates will gain an internationally-recognised qualification that will stand them in good stead when developing careers, both in the management of vineyards and wineries, winemaking research or consultancy, both in the UK and abroad.
The MSc Viticulture & Oenology programme consists of a rounded and integrated curriculum specialising in cool-climate wine production, climate change effects on viticulture, sustainability and sparkling wine, and includes opportunities to visit other wine-producing areas in Europe. The Wine Research Centre, together with a strong staff team with considerable international expertise and research experience, will ensure that students gain an outstanding Masters-level education.

Viticulture apprenticeship scheme is a government approved new Level 3 Crop Technician apprenticeship standard into a new Viticulture apprenticeship, which will be delivered on a national basis, and provide excellent coverage of all aspects of practical vineyard management.

Endorsed by Wines of Great Britain (WineGB), students will learn a variety of skills including: canopy management and pruning, key vineyard operations as well as tractor driving and use of vineyard machinery. The course also incorporates a range of competency certificates, such as first aid and pesticide application.

The apprenticeship is work based and would require attendance at Plumpton Wine Division on block placements over the two-year period, during which accommodation will be provided making the course nationally accessible.

Graduates from Plumpton College can be found in all sectors of the wine industry and throughout the world:
Ellie Baker: Restaurant/Bar Manager, Madrid, Spain
Simon Barker: Winemaker, Barker's Marque Estate, Marlborough, New Zealand
Mark Barnes: Vineyard Manager, Chilford Hall Vineyard, UK
Sara Basra: wine magazine Editor, London.
Max Birch: Winemaker, Quinta do Miradouro, Algarve, Portugal.
Jon Bowen: Vineyard Owner/Manager, Minervois, France
Henry Breeze & Robert Poole, Proprietors, Wine Symposium, Lewes
Peter Buckley: Managing Director, Noble Green Wines Ltd, UK
Sarah Cameron: Vineyard Owner/Manager, Toulouse, France
Richard Case: Owner/Manager of Domaine de la Pertuisane, Rousillon.
Kyri Christodolou: Sommelier, n°35 Restaurant, Melbourne, Australia
Jim Close: Winemaker, Source Napa Winery, California, USA.

Ashika Cobham: Buyer, The Antique Wine Company, UK
Jose Cortijo: Commercial Manager, Bodega Sanchez Romate, Jerez, Spain
Simon Coulshaw: Owner/Manager, Domaine des Trinités, Faugères, France
Jonathan Coulthard: Vineyard Owner/Manager, Cote de Duras, France.
Alistair Coulthurst, Las Bodegas, UK
Hugh Crighton: Assistant Winemaker, Vidal Estates, NZ
Gavin Crisfield : Winemaker, Terrasses de Larzac, France
Myles Cunliffe: Cocktail Trainer & Wine Consultant, London
Anton Davis, Les Caves de Pyrene, UK
Josh Donaghay-Spire: Winemaker, Chapel Down Winery, UK
Robert Doyle: Vineyard Manager, Domaine de la Pertuisane, France
Kristy Dunn: Liquid Developer, Diageo plc, UK
Owen Elias: Winemaking Consultant, UK
Stephen Farquharson: Wine Importer & Vineyard Owner/Manager, Central Otago, NZ.
Graham Fisher: Vineyard Manager, Bride Valley Vineyard, UK
Carol Forrest: Company Manager, The Majorca Wine Tour, Spain
Patrick Fuchs: Cellarmaster, Spitalweingut Kiefer, Baden, Germany
Darcy Gander & James Dodson: Vine-Works vineyard contractors, UK
Elizabeth Garrett: Winemaker, Bolney Wine Estate, UK
Hugh Girling: Production Winemaker, Marlborough Vintners, NZ
George Gresty, Cellar Door Manager, Silkwood Wines, Australia
Owen Guillemin: Logistics, Armit Wines, UK
Nick Hall: Vineyard Manager, Herbert's Hall Vineyard, UK
Charlie Holland: Winemaker, Gusborne wines, UK
Gavin Holt: Independent Wine Retailer, Witham Wines, UK
Carol Howard: Buying Director, Eau de Vie ltd., UK
Andrew Hunt & Ailsa Grice: Vineyard Owners/Managers, Corbières, France
Sue Hunt: Owner/Manager of wine-focused B & B, Loire Valley
Liam Idzikowski: Winemaker, Lyme Bay Winery, UK
Toby Jefferys, Trading Controller,The Dhamecha Group UK
Mike Jones: Winemaker, GisVin, Gisbourne, NZ
Janette Kelly: Online Learning Coordinator, WSET, UK
Belinda Kemp: Senior Researcher, CCOVI, Brock University, Canada
Natalia Kozlowska; Sommelière, Crockford's Casino
Chris Lamb, Berry Bros & Rudd, UK
James Le Grys: Brand Manager, J. Wray & Nephew, UK
James le Bouedec, Proprietor, The Barrique Club
Roz London: Shipping and Logistics Manager, From Vineyards Direct, UK
Daniel Lucey: PR & Marketing Executive, Bon Coeur Fine Wines, London
David Main: Winemaker, Hunter Wine Services, Australia
Oliver Marsh: Marketing Manager, Ridgeview, UK
Alex Mills: Winemaker, Pebblebed Vineyards, UK
Anouck Mittaz, Assistant, Fine Wine Magazine
Tara Neal: Junior Winemaker, D & D Wines.
Rupert Nicholson: Director, Carte Blanche Wines, UK

James Oag-Cooper, Manager Director, Foxhole Spirits, UK
Sue Osgood: Vineyard Manager, Bolney Wine Estate, UK
Xenofon Panayiotou: Government Inspector of Vineyards and Wineries, Cyprus
Nicholas Pead: International Development Team, WSET, UK
Will Philip: Business Development Manager, Hattingley Valley, UK
Tom Platt: National Accounts Manager, Liberty Wines, UK
Jon Pollard: Vineyard Manager, Gusbourne Vineyard, UK
Kevin Powell: Independent Wine Educator, UK
Damon Quinlan: Director, SWIG Wines, ltd
Claire Rawlinson: Editorial Co-coordinator at the Royal Society, UK
Emma Rice: Director/Oenologist, Custom Crush UK Ltd
Simon Roberts: Winemaker, Ridgeview Vineyards
Dan Robertson, Manager, Fuller Smith & Turner Wine Sales
Sandy Robertson: Enologist, Merry Edwards Wines, California, UK
Thomas Sanetra, Sommelier, Hotel du Vin, UK
David & Deborah Sax: Winemakers, New Zealand
John Seccombe: Winemaker, Thorne & Daughters, South Africa
Tersina Shieh: General Manager, Independent Wine Centre, Hong Kong
Mark Shipway: WSET Coordinator, Canada
Cathy Shore: Wine Tutor/Manager, Le Tasting Room, Saumur, France
Simon Spencer: Consultant Winemaker, Vancouver Island, Canada
Sambrooke Spurrier, Sipsmith Independent Spirits, UK
Matthew Strugnell: Vineyard Manager, Ridgeview Vineyard, UK
Louise Taylor: Wine Sales Manager, Matthew Clarke
Sean Tennyson, Boutinot, UK
David Timmons: Independent Wine Educator, Brighton, UK
Liam Tinston: Winemaker, Three Choirs Vineyard, UK
Pandora Turbett, Vagabond Wines, UK
Jean-Philippe Tytgadt: Wine Importer, Belgium
Louis Villard: Wine Journalist, Santa Barbara, California
Claire Whitehead: Education officer, Liberty wines, UK
Robin Williamson: Vineyard Owner/Manager, Languedoc, France
Andrew Wood: Winemaker, Kangarilla rd, McLaren Vale, Australia
Simon Woodhead: Vineyard owner/Manager, Stopham Vineyard, UK
Paul Woodrow-Hill: Vineyard Consultant, UK
David Zyw: Global Wine Buyer, Direct Wine, UK

For more information on any of the Wine department courses, please contact chris.saunders@plumpton.ac.uk or visit https://www.plumpton.ac.uk/courses/wine-division/